FY03 MCA PN 52068 & BUP 52069
WHOLE BARRACKS RENEWAL
BRIGADE COMPLEX, PHASE 3A, QUAD C

# STATEMENT OF WORK

16 June 2003

U.S. ARMY CORPS OF ENGINEERS
Honolulu Engineer District

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25. GEAR WASH/RECREATION BUILDING

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# CHAPTER 1

## DESIGN OBJECTIVES

1-1 **SCOPE OF WORK**. Design and construction shall comply with the specifications and requirements contained in this Request for Proposals (RFP). The design and technical criteria contained and cited in this RFP establish minimum standards for design and construction quality. The objective of this solicitation is to renovate and improve an existing Brigade Complex . This contract shall consist of the design for renovation and improvement of the existing Quad C located on a 7-acre site bounded by Waianae, Foote, Meigs and Flagler Avenues.

1-1.1 **Site Area**. The site is described on the RFP drawings included as part of this solicitation and includes approximately 7 acres.

1-1.2 **Site Work**. Site work includes all design and construction of site features described in the RFP, including but not limited to upgrading of the existing water distribution/fire protection/sewer/drainage systems, site grading, new curbs/gutters, new walkways, new AC paved access roads, additional parking, new surfacing/striping/goal posts for the basketball court, installation of traffic gates, bike racks/slabs and a new trash enclosure.

1-1.3 **Special Utilities and Supplementary Construction**. Not required/not applicable.

1-1.4 **Demolition Considerations and Requirements**. Existing water/sewer/drainage facilities, fencing, AC pavement, curbing and walkways within Quad C shall be removed as required for AT/FP standoff requirements. In compliance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, the National Park Service (NPS), the Advisory Council for Historic Preservation (ACHP), the Hawaii State Historic Preservation Officer (SHPO), the Historic Hawai'i Foundation (HHF), the Outdoor Circle (OC), and other interested parties shall be afforded the opportunity to review and comment on demolition proposals before any decisions are made final.

1-1.5 **Environmental Considerations and Mitigation Requirements**. A programmatic Environmental Assessment was completed to address USARHAW's Whole Barracks Renewal Program and a Finding of No significant Impact (FONSI) was signed by the Installation Commander 20 July 1995. A supplemental Environmental Assessment has been completed for the Quad renovations.

1-2 **APPLICABLE CRITERIA**. Applicable design and construction criteria references are listed in the RFP sections and Attachments of the Statement of Work. Criteria shall be taken from the most current references as of the RFP issue date. Referenced codes and standards are minimum acceptable criteria. Administrative, contractual, and procedural features of the contract shall be as described in other sections of the RFP.

1-3 **DESIGN QUALITY.** The main objectives of this solicitation are to obtain an improved Brigade Complex including support facilities and associated site development within funds available, and to maximize design quality. Design quality is achieved through the optimization of interior planning, integration of buildings with the site, sustainability, selection of building systems for low-cost maintenance and operation, and an overall balance of aesthetics and functionality.

1-4 **DESIGN REQUIREMENTS**. Requirements stated in this RFP are minimums. Designs may incorporate factory fabricated components or modules.

1-5 **ENERGY AND RESOURCES CONSERVING FEATURES**. Public Law 102-486, Executive Order 12902, and Federal Regulations 10 CFR 435, require federal buildings to be designed and constructed to reduce energy consumption in a life-cycle, cost-effective manner using renewable energy sources when economical. Products designed to conserve energy and resources by either controlling the amounts of

consumed energy or by operating at increased efficiencies should be considered. Minimum requirements for this project are listed in the Statement of Work.

1-6 **INSTALLATION REAL PROPERTY MASTER PLAN**. The installation real property master plan provides comprehensive documentation of the existing conditions of natural, man-made, and human resources. It also guides future land-use development. Design of this project shall incorporate the design guidance and criteria contained in the Schofield Barracks Real Property Master Plan, excerpts of which are contained in an attachment to the Statement of Work.

1-7 **ACCESSIBILITY REQUIREMENTS**. All areas and facilities required to be accessible to physically disabled persons shall conform to the Uniform Federal Accessibility Standards (UFAS) Federal Standard 795, and the Americans With Disabilities Act Accessibility Guidelines (ADAAG). The following areas shall be accessible:

1-7.1 Areas that may be used by non-military employees or visitors. Specific areas are indicated in the Statement of Work.

1-7.2 Handicap accessible visitor and non-military employee parking spaces near buildings as indicated in Chapter 3 of the Statement of Work.

1-7.3 Minimum of one accessible pedestrian route linking handicap accessible parking areas with accessible building entrances.

1-8 **ANTI-TERRORISM AND FORCE PROTECTION CONSIDERATIONS**. The anti-terrorism and force protection shall be designed in accordance with the Department of Defense Minimum Antiterrorism Standards for Buildings, July 31, 2002, UFC 4-010-01. The requirement for floor reinforcing (FRP or equal) as required by paragraph B-2.1.3 of UFC 4-010-01 has been listed as a separate bid option since it is not required in accordance with the Interim Department of Defense Antiterrorism/Force Protection Construction Standards, dated 5 Dec 1999. Refer to Section 01010, Chapter 6, Structural Design and Attachment 9, Blast and Progressive Collapse Vulnerability Assessment (Concept Design) for anti-terrorism and force protection (AT/FP) structural design criteria. AT/FP structural design criteria does not require building hardening since standoff distances have been met by providing controlled access parking and a parking ban along the roads within the standoff distances, in accordance with UFC 4-010-01.

1-9 **HISTORIC PRESERVATION (SECTION 106):** In compliance with Section 106 of the NHPA of 1966, NPS, ACHP, SHPO, HHF, OC, and other interested parties shall be afforded the opportunity to review and comment on all design proposals before any decisions are made final.

1-10 **ORGANIZATIONAL STRUCTURE**. The renovated Quad under this solicitation will be occupied by soldiers. This solicitation will provide working and living accommodation spaces for enlisted personnel in the 3rd Brigade, 25th Infantry Division (Light).

**<u>Building 355:</u>**

- One Medium COF HHC 3rd Infantry Brigade
- One Large COF 2-5th Infantry Battalion HHC
- One Medium COF 2-5th Infantry Battalion Rifle Company
- One Medium COF 2-5th Infantry Battalion Rifle Company
- One Medium COF 2-5th Infantry Battalion Rifle Company
- Renovate existing Gymnasium space on the 3rd Floor

**<u>Building 357:</u>**

- One 501-800PN Enlisted Personnel Dining Facility (EPDF)
- One Large Battalion Headquarters (Btn HQ) with Troop Aid Station
- One 300PN Soldier Community Functions without Bulk Storage

**Building 356:**
150PN Unaccompanied Enlisted Personnel Housing (UEPH)
**Building 358:**
150PN Unaccompanied Enlisted Personnel Housing (UEPH)

# CHAPTER 2

# FUNCTIONAL AND AREA REQUIREMENTS

## 2-1 GENERAL REQUIREMENTS

2-1.1 **Building Functionality**. Functional spaces depicted on the RFP Concept Design Drawings have been coordinated with the proper contacts and have been sized and arranged for efficient use and circulation. The Design Build offerors shall incorporate the RFP Concept Architectural Design into their design proposal. The floor plan layout and relationship of functional spaces depicted in the architectural floor plans shall not be deviated from. All architectural criteria must be met and accounted for, see paragraph 5-2 Applicable Codes and Standards. Any changes shall be brought to the attention of the Contracting Officer for resolution in writing.

2-1.2 **Gross building area definition**. Gross building area is measured to the outside face of exterior enclosure walls. Gross area includes floor areas, penthouses, mezzanines, and other spaces as follows:

2-1.2.1 **Areas calculated as half space**. Gross area includes one-half the area of exterior covered areas such as balconies, entries, loading platforms, breezeways, exterior corridors, and porches. Exterior covered areas are measured from the face of the enclosure wall to the edge of the covered area served. Open Stairs count as half space for each floor they serve.

2-1.2.2 **Excluded space**. The following spaces are excluded from gross area calculations: Attic areas where average clear height does not exceed 2.13m [7 feet]; crawl spaces; exterior uncovered loading platforms; open courtyards; normal roof overhangs and soffits for weather protection; uncovered ramps and steps; utility tunnels; raceways; mechanical equipment platforms and catwalks.

2-1.3 **Gross area limitations**. Refer to RFP Concept Design Drawings for gross building area limitations for this RFP. Proposals shall not exceed authorized gross area limitations.

2-1.4 **Net area definition**. Net area is measured to the inside face of the room or space walls.

2-1.5 **Net Area Requirements**. Refer to RFP Concept Design Drawings for net area requirements for programmed spaces included in this chapter. The space is sized to accommodate the required function, comply with code requirements, and other requirements of the RFP.

2-1.6 **Finish Requirements**. Room finishes stated in the following paragraphs are minimums.

2-1.7 **Furniture Requirements**. The offeror is required to work with the customer to develop a Comprehensive Interior Design Package (CID) for all Quad C Buildings. Refer to SOW Chapter 14 for CID requirements. A Furnishings/Fixtures/Equipment (FF&E) paragraph description has been provided for each space for each Quad C Building, (i.e. paragraphs 2-2.1.1.2, 2-2.1.2.2, 2-2.1.3.2, etc…). These paragraphs determine which items are Government furnished and installed or Contractor furnished and installed. The offeror is required to work with the customer to determine specific furniture criteria such as acceptable materials, finishes and quality levels. The number and location of furnishings serve as an indicator of the number of power, data and communications connection points. See electrical section for more detail. The Furnishings described in the FFE paragraph for all spaces in Chapter 2 are for information only and is a starting point for the CID discussion purposes between the customer and the successful offeror.

2-1.7.1 The offeror is not required to purchase the Furnishings (tables, chairs, sofa, bed, etc.) for the programmed spaces unless noted otherwise. Also, the offeror is not required to provide equipment that is not installed (refrigerator, microwave, washer, and dryer).

**2-2 BUILDING 355 - COMPANY OPERATIONS FACILITIES FUNCTIONAL AND AREA REQUIREMENTS.** RFP Concept Design Drawings is separate and is included with this Specification Manual to describe the complete scope of work for this project. The company operations facilities (COF) building(s) shall consist of administrative areas, heavy equipment storage and light equipment storage for each company, support spaces, and common locker/shower facilities. Building 355 contains the Heavy Equipment storage for four medium and one large Company Operations Facilities (COF) and one COF Toilet/Shower located on the first floor. COF Administration Offices and Classrooms for three medium COFs and one COF Toilet/Shower will occupy the second floor. COF Administration Offices and Classrooms for one medium COF and one large COF and one Toilet/Shower will occupy the third floor. COF functions and areas that occur in Building 355 shall be as follows:

2-2.1 **COF Administrative Areas**. Provide one group of administrative areas per company. Company leadership will manage the organization, receive visitors, and conduct day-to-day business from the COF administrative areas. Entrance shall be separate and distinct from the entrances to company light equipment storage areas and to COF administrative areas. Each COF Administrative area shall be provided with a Company Identification Sign (5 total) see paragraph 5-8.2.6. Military personnel will staff the facility. Provide the following areas for each company:

2-2.1.1 **Company Commander (CO)**. Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.1.1 Function: Private office for commanding officer.

2-2.1.1.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one credenza, one bookcase, two legal-size four-drawer file cabinets, one conference table, four side chairs, and one desk chair.

2-2.1.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.1.4 Other requirements: Provide 914 mm 3'-0" wide door into room. Room shall have exterior window.

2-2.1.2 **Executive Officer (XO)**. Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.2.1 Function: Private office for the company executive officer.

2-2.1.2.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed:one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-2.1.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.2.4 Other requirements: Provide 914 mm 3'-0" wide door into room. Room shall have exterior window.

2-2.1.3 **First Sergeant (1 SG)**. Provide one per company located on the second and third floors.

Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.3.1 Function: Private office for the company first sergeant (highest ranking non-commissioned officer).

2-2.1.3.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-2.1.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-2.1.4 **Training Officer (TNG)**. Provide one per company located on the second and third floors. Room shall be accessed through the Admin Office. Occupants: 1, and occasional visitors.

2-2.1.4.1 Function: Private office for the company Training Officer.

2-2.1.4.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-2.1.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-2.1.5 **Admin Office (ADMIN OFF)**. Provide one per company located on the second and third floors, including interior circulation. Room shall be accessed through the Waiting Area. Occupants: 2 clerks, and occasional visitors.

2-2.1.5.1 Function: Office for company administrative clerks, storage of files, access to private offices. Clerks will have visual control of waiting area and conference room door.

2-2.1.5.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: two clerk desks with returns and desk chairs. The following items will be Contractor furnished and installed: reception desk (built-in casework), as indicated on the concept design drawings separating the Admin Office from the Waiting Area. The counter on the Waiting Area side shall be 1016 mm high x 305 mm deep. Admin side of reception desk shall be at desk height, and shall accommodate computer and monitor (not in contract), and writing area. Provide task lighting at all writing surfaces. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts.Provide a floor anchor for one GFGI security safe. Coordinate anchor location with furniture layout; refer to paragraph 5-7.2.8.

2-2.1.5.3 Finishes:
Floor: vinyl composition tile

Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door into room from Waiting Area.

2-2.1.6 **Administrative Area Corridor**. Circulation to building spaces shall comply with applicable code egress requirements. Unless otherwise required, administrative area corridor shall be capable of being secured from exterior entrances and from any adjacent public, unsecure corridors.

2-2.1.6.1 Function: Circulation and means of egress.

2-1.1.6.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one handicap accessible electric water cooler; fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.1.6.3 Finishes:
Floor: vinyl composition tile.
Base: resilient cove base.
Walls: impact resistant gypsum wallboard with painted finish.
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.7 **Waiting Area (WAIT)**. Provide one per company located area on the second and third floor, incorporated into the Administrative Area Corridor. Occupants: Two or more visitors; additional visitors (e.g. those waiting to attend a large meeting in the conference room) will wait in the adjacent corridor.

2-2.1.7.1 Function: Waiting and reception area for company soldiers and visitors. Control point for access to admin office and conference room.

2-2.1.7.2 Furnishings/Fixtures/Equipment (FFE): the following items will be government furnished and installed: two side chairs; one 1219 mm high x 1829 mm wide [4'-0" x 6'-0"] wall mounted bulletin board.

2-2.1.7.3 Finishes: Match Administrative Area Corridor.

2-2.1.8 **Platoon Office (PLT)**. Provide four platoon offices per company located on the second and third floors as depicted on the RFP Concept Design Drawings. Offices shall be accessed directly from the Administrative Area Corridor, or through a common space that is accessed from the Administrative Area Corridor. Occupants: 1 in each office, and occasional visitors.

2-2.1.8.1 Function: Private office for platoon leaders or other administrators.

2-2.1.8.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: one desk with return, one side chair and one desk chair.

2-2.1.8.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.8.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.9 **Platoon Open Office (PLT OPEN OFF)**. Provide one per company located on the second and third floors, including interior circulation. Room shall be accessed through the Waiting Area. Occupants: 2 clerks, and occasional visitors.

2-2.1.9.1 Function: Office for platoon administrative clerks, storage of files, access to private offices. Clerks will have visual control of waiting area.

2-2.1.9.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: two clerk desks with returns and desk chairs.

2-2.1.9.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.9.4 Other requirements: Provide 914 mm [3'-0"] wide entry door into room from Waiting Area.

2-2.1.10 **Conference Room (CONF RM)**. Provide one per company located on the second and third floors. Room shall be accessed from the Waiting Area (preferable), or through the Admin Office. Admin clerks shall have visual control of Conference Room door. Occupants: up to 22 persons.

2-2.1.10.1 Function: Conference room for company leadership, staff, and visitors. Functions will include staff meetings, hearings, disciplinary sessions, training.

2-2.1.10.2 Furnishings/Fixtures/Equipment: the following items will be government furnished and installed: tables and chairs for minimum 22 people; one marker board (minimum 2438 mm wide x 1219 mm high [8'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]. The following item will be Contractor furnished and installed: recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"].

2-2.1.10.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.10.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.11 **Conference Room Storage (ST)**. Provide one per company located on the second and third floors. Room shall be accessed from the Conference Room.

2-2.1.11.1 Function: Closet for storage of folding tables, display easels, etc.

2-2.1.11.2 Furnishings/Fixtures/Equipment:

2-2.1.11.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.11.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.12 **Toilet (TOI)**. Provide two private unisex toilet rooms per company located on the second and

third floor COF Administration area. Room shall be sized to comply with handicap accessibility requirements. Room shall be accessed from Administrative Area Corridor.

2-2.1.12.1 Function: Unisex single-occupant toilet, lavatory, and shower; for use by staff and visitors.

2-2.1.12.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, toilet tissue dispenser, one toilet seat cover dispenser; and one ceramic tile shower enclosures and shower fixture and fittings.

2-2.1.12.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-2.1.12.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.13 **Janitor Closet (JAN).**. Provide one per company located on the second and third floors. Room shall be accessed from Administrative Area Corridor.

2-2.1.13.1 Function: Service sink and storage of cleaning supplies, soap, and paper products.

2-2.1.13.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted mop sink, mop rack for three mops, and minimum 1524 linear mm of wall mounted stainless steel shelving.

2-2.1.13.3 Finishes:
Floor: ceramic tile
Base: ceramic tile base
Walls: painted water-resistant gypsum wallboard.
Ceiling: painted gypsum wallboard

2-2.1.13.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.1.14 **Administration Storage (ST)**. Provide one per company located on the second and third floors. Room shall be accessed from the Administration area.

2-2.1.14.1 Function storage for folding tables, display easels, etc.

2-2.1.14.2 Furnishings/Fixtures/Equipment:

2-2.1.14.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-2.1.14.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.2 **COF HEAVY EQUIPMENT STORAGE AREAS**. Provide one group of Heavy Equipment Storage areas per company consisting of Equipment Maintenance Area, Arms Vault, and Unit Storage. COF Heavy Equipment Storage Areas are required for four medium and one large Company Operations Facilities (COF).

COF Heavy Equipment Storage areas will be used to store, clean, and repair company operational equipment and weapons. Main entrance to Heavy Equipment Storage areas will be from paved service area inside the Quad; service area will be used for loading company equipment on and off of large trucks. Entrance shall be separate and distinct from the entrances to company administrative areas and to other COF Light Equipment Storage areas. Each COF Heavy Equipment Storage Area shall be provided with a Company Identification Sign (5 total), see para. 5-8.2.6. The sign will be located at the exterior wall space adjacent to the entrance. Only able-bodied military personnel will occupy COF supply areas; handicapped accessibility is not required. Heavy equipment storage areas for the COFs will have full height CMU. Provide the following areas for each company:

2-2.2.1 **Equipment Maintenance Area (EQUIP MAIN)**. Provide one for each company area on the first floor.

2-2.2.1.1 Function: Equipment cleaning, repair and access to COF storage spaces.

2-2.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: stainless steel equipment cleaning sinks 711 mm x 711 mm x 172 mm deep [28” x 28” x 6 ¾”], (three sinks for large and medium companies), locate near exterior doors. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.2.1.3 Finishes:
Floor: sealed concrete
Base: none
Walls: painted concrete, or painted concrete masonry unit walls separating COF heavy storage areas.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.1.4 Other requirements: All entry doors into Equipment Maintenance Area shall have auxiliary deadlocks (thumb turn inside, keyed cylinder outside).

2-2.2.2 **Arms Vault (ARMS VAULT)**. Provide one Arms Vault for each company on the first floor. Construction of Arms Vault shall comply with paragraph 5-7.2. Coordinate with the authority having jurisdiction for specific construction requirements.

2-2.2.2.1 Function: Storage and issue of weapons.

2-2.2.2.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: arms rack anchor rings on all walls inside Arms Vault; refer to paragraph 5-7.2. Arms racks are not in contract.

2-2.2.2.3 Finishes:
Floor: sealed concrete
Base: none.
Walls: painted concrete, or painted concrete masonry units.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.2.4 Other requirements: requirement for dehumidifier.

2-2.2.3 **Unit Storage (UNIT ST)**. Provide one Unit Storage for each company on the first floor. Provide access from Equipment Maintenance Area and from exterior service yard.

2-2.2.3.1 Function: Storage of miscellaneous equipment.

2-2.2.3.2 Furnishings/Fixtures/Equipment: None.

2-2.2.3.3 Finishes:

Floor: sealed concrete
Base: none
Walls: Provide painted concrete masonry units.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.2.3.4 Other requirements: Provide a pair of 914 mm wide hollow metal doors opening onto the paved service yard; doors shall have hold open devices with auxiliary deadlocks (thumb turn inside, keyed cylinder outside). Provide historic doors as required. Provide 914 mm [3'-0"] wide swinging door with keyed cylinder lock in wire mesh partition at Equipment Storage.

2-2.3 **COF LIGHT EQUIPMENT STORAGE AREAS.** Provide one group of Light Equipment Storage areas per company consisting of General Storage, NBC Storage, Comm Storage, Fire Control Storage, and TA-50 Gear Storage. COF Light Equipment Storage Areas are required for four medium and one large Company Operations Facilities (COF). Individual TA-50 gear lockers shall be provided: minimum 80 lockers for large COF and 60 lockers for each Medium COF. Each COF Light Equipment storage shall be provided with a Company Identificaton Sign (5 total), see para. 5-8.2.6. Military personnel will staff the facility. Provide the following areas for each company.

2-2.3.1 **General Storage (GEN ST)**. Provide one General Storage for each company located on the second and third floor.

2-2.3.1.1 Function: Storage of soldier and miscellaneous equipment.

2-2.3.1.2 Furnishings/Fixtures/Equipment: None

2-2.3.1.3 Finishes:
Floor: sealed concrete
Base: resilient base
Walls: Provide painted impact resistant gypsum wallboard,
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door.

2-2.3.2 **Nuclear, Biological and Chemical Equipment Storage (NBC)**. Provide one NBC Storage for each company on the second and third floor.

2-2.3.2.1 Function: Storage of equipment for use in defense of nuclear, biological or chemical warfare.

2-2.3.2.2 Furnishings/Fixtures/Equipment: None.

2-2.3.2.3 Finishes:
Floor: sealed concrete
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door.

2-2.3.3 **Communications Storage (COM ST)**. Provide one Communications Storage for each company on the second and third floor.

2-2.3.3.1 Function: Storage of radios and communications field gear.

2-2.3.3.2 Furnishings/Fixtures/Equipment:

2-2.3.3.3 Finishes:
Floor: sealed concrete
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.3.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door.

2-2.3.4 **TA-50 Storage (TA-50)**. Provide one TA-50 Storage for each company located on the second and third floor. Size and configure area to accommodate as many TA-50 locker units per company (allow minimum 2438 mm [8'-0"] clearance between parallel rows of lockers; minimum 914 mm [3'-0"] between open locker doors and obstructions). These quantities shall be verified with the Company Commanders.

2-2.3.4.1 Function: Gear lockers for storage of individual soldier's TA-50 field gear.

2-2.3.4.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: TA-50 gear lockers; lockers size: minimum 559 mm (w) x 914 mm (d) x 1067 mm (h) [22"w x 36"d x 42"h]. Lockers shall be stacked two high.

2-2.3.4.3 Finishes:
Floor: sealed concrete
Base: resilient base.
Walls: provide painted concrete masonry unit walls separating TA-50 Storage from adjacent COF spaces.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.4.4 Other requirements: Provide a pair of 914 mm [3'-0"] wide hollow metal doors.

2-2.3.5 **Fire Control (FIRE CTL)**. Provide one Fire Control Room for each company on the second and third floor.

2-2.3.5.1 Function:. Storage

2-2.3.5.2 Furnishings/Fixtures/Equipment: None.

2-2.3.5.3 Finishes:
Floor: sealed concrete
Base: resilient base.
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-2.3 **BUILDING 355 SUPPORT AREAS**. Only able-bodied personnel will occupy Building 355 support areas; handicapped accessibility is not required, except that stairs and corridors shall comply with handicapped accessibility requirements of applicable codes.

2-2.3.1 **Mechanical Room(s) (MECH)**. Provide dedicated areas for mechanical equipment located on all floors of Building 355. Each company shall have independent operation and control of HVAC system for its own spaces, but mechanical equipment may serve more than one company, and mechanical rooms may be combined. Mechanical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Provide floor openings and vertical shaft spaces as necessary.

2-2.3.1.1 Function: Spaces for HVAC, water heating, and other plumbing and mechanical equipment.

2-2.3.1.2 Furnishings/Fixtures/Equipment: None.

2-2.3.1.3 Finishes: Floor: sealed concrete
Base: resilient cove base
Walls: painted impact resistant gypsum board.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.1.4 Other requirements: Doors shall have storeroom function lockset master-keyed to existing system.

2-2.3.2 **Electrical Room(s) (ELE)**. Provide dedicated areas for electrical equipment located on all floors of Building 355. Each company shall have independent metering and control of the electrical system for its own spaces, but electrical equipment may serve more than one company, and electrical rooms may be combined. Electrical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Provide floor openings and vertical shaft spaces as necessary.

2-2.3.2.1 Function: Spaces for electrical equipment.

2-2.3.2.2 Furnishings/Fixtures/Equipment: None.

2-2.3.2.3 Finishes: Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.2.4 Other requirements: Electrical service to buildings shall be underground. Doors shall have storeroom function lockset master-keyed to existing system..

2-2.3.3 **Telecommunication Room (TELE)**. Provide dedicated interior room(s) for communication distribution equipment located on all floors of Building 355. Room(s) shall be dedicated to one company, and shall not be combined with mechanical or electrical rooms. Room(s) may be accessed from Administrative Area Corridor, public unsecure corridor (if provided), or Equipment Maintenance Area. Access will be limited to authorized personnel. Provide each company with one main communication room; minimum size 3048 mm [10'-0"] x 3353 mm [11'-0"]. Provide additional communication rooms as needed; all spaces having telephone or computer data outlets shall be located to allow a maximum cable length of 90 m [295 feet] between outlet and communication room. Minimum dimensions of secondary communication rooms shall be 2134 mm [7;-0"] x 3048 mm [10'-0"]. Provide floor openings and vertical shaft spaces as necessary.

2-2.3.3.1 Function: Telephone and data network support spaces for the COF.

2-2.3.3.2 Furnishings/Fixtures/Equipment: None.

2-2.3.3.3 Finishes: Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.3.4 Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with storeroom function lockset master-keyed to existing system..

2-2.3.4 **Existing Sprint Switch Room (EXIST SPRINT SW RM)**. Located on the first floor. Existing dedicated interior room for communication distribution equipment.

2-2.3.4.1 Function: Telephone and data network support spaces for the COF.

2-2.3.4.2 Furnishings/Fixtures/Equipment: None.

2-2.3.4.3 Finishes: Floor: vinyl composition tile
Base: resilient cove base
Walls: .painted concrete masonry units.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.4.4 Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with storeroom function l master-keyed to existing system.

2-2.3.5 **Exterior Stairs**. Provide as required to allow circulation to upper floor of the building. Comply with applicable code egress requirements. This description covers all Exterior Stairs at for Building 355.

2-2.3.5.1 Function: Circulation and means of egress.

2-2.3.5.2 Furnishings/Fixtures/Equipment (FFE): None.

2-2.3.5.3 Finishes: Landing floor: sealed concrete with slip-resistant finish texture.
Base: exterior wall material
Treads: Sealed concrete with slip-resistant nosing
Risers: sealed concrete
Walls: exterior wall materials
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-2.3.5.4 Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railing shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-2.3.6 **Breezeway (BREEZEWAY)**. Occurs on the first floor of Building 355. Refers to an unconditioned, covered corridor space that is enclosed on the long sides, but open to the exterior on the ends. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements.

2-2.3.6.1 Function: Circulation and means of egress.

2-2.3.6.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations. The following item shall be Contractor furnished and installed: provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.3.6.3 Finishes:
Floor: sealed concrete
Base: Exterior wall material
Walls: Exterior wall material
Ceiling: painted exterior gypsum soffit board.

2-2.3.6.4 Other requirements: With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in breezeway. Provide slip resistant finish texture on concrete floor.

**2-2.4 Common Locker/Shower Facilities (COF TOILET/SHOWER)**. Provide one group of men's and one group of women's common locker/shower facilities for each company. Three (3) COF Toilet/Showers shall be provided , one on each floor, in Building 355. Two (2) COF Toilet/Showers shall be

provided on the second floor in Building 357. The COF Toilet/Shower for the Large COF shall be located on the third floor of Building 355.. Quantities of lockers and plumbing fixtures for men and women vary by company size. Provide the quantity of lockers and fixtures for Medium Company Operations Facility on the first and second floor and as indicated in the table below. Provide the quantity of lockers and fixtures for Large Company Operations Facility on the third floor and as indicated in the table below. Soldiers will use locker rooms before and after physical training. Handicapped accessibility is not required. Additional entrances may be provided from a common public corridor in the COF. Entrances shall be separate and distinct from the entrances to company supply and administrative areas. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-2.4 Locker Room Plumbing Fixture and Locker Quantities**

| | LARGE COMPANY | | MEDIUM COMPANY | |
|---|---|---|---|---|
| | **MEN** | **WOMEN** | **MEN** | **WOMEN** |
| **Lockers** | 150 | 14 | 82 | 8 |
| **Toilets** | 2 | 2 | 2 | 1 |
| **Urinals** | 2 | - | 1 | - |
| **Lavatories** | 4 | 1 | 2 | 1 |
| **Showers *** | 8 | 2 | 5 | 1 |

2-2.4.1 **Women's Locker Room**. Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-2.4.1.1 Function: Toilets, showers and lockers for female soldiers.

2-2.4.1.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.4.1.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-2.4.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-2.4.2 **Men's Locker Room**. Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying

room area x the occupant load factor.

2-2.4.2.1 Function: Toilets, showers and lockers for male soldiers.

2-2.4.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; one double pin robe hook outside each shower; one robe hook on each toilet partition door. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-2.4.2.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-2.4.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

**2-3 BUILDING 355 - GYMNASIUM FUNCTIONAL AND AREA REQUIREMENTS.**

2-3.1 Function: Multi-function space.

2-3.2 Furnishings/Fixtures/Equipment: reuse existing basketball backboards

2-3.3 Minimum Finishes:
Floor: Refinish existing floors and stripe as directed and seal.
Base: none
Walls: paint existing walls-and decorative wall elements; new seismic work cannot cover existing decorative wall elements. Offeror must incorporate eclectic wall features into the seismic wall design and cannot conceal existing Historic features.
Ceiling: apply one-hour fire resistive material to existing metal deck and truss roof structure.

**2-4 BUILDING 356 and 358 - UNACCOMPANIED ENLISTED PERSONNEL HOUSING (UEPH) FACILITIES FUNCTIONAL AND AREA REQUIREMENTS.** The UEPH building(s) shall consist of living units, common areas, and support spaces that will occupy all three floors of Building 356 and 358. Each living unit shall be designed to be occupied by one or two soldiers. Provide 66 Two-person living units and 18 One-person living units to house a total of 150 enlisted personnel. Living units and common areas are equally distributed among three floors in Buildings 356 and 358. Only able-bodied military personnel will occupy UEPH Buildings; handicapped accessibility is not required. Building spaces and areas shall be as follows:

2-4.1 **Areas Comprising the <u>Two-Person Living Unit</u> (1+1 Module)**. Each Two-Person living unit, or module, will contain two individual living/sleeping rooms with closets, and a shared service area with Kitchen, and a shared bathroom. Spaces are as follows.

2-4.1.1 **Individual Living/Sleeping Room (BEDROOM 1/BEDROOM 2)**. Provide two per module.

2-4.1.1.1 Function: Private bedroom and living space for one enlisted person.

2-4.1.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: One twin bed with headboard and footboard 102mm x 2083mm [40" x 85"]; one entertainment center for occupant's television and sound system 864mm wide x 635mm deep x 1930mm high [34" x 25" x 76"]; one chest of drawers 712mm wide x 458mm deep x 661mm high [28" x 18" x 26" high]; one nightstand 485mm wide x 435mm deep x 535mm high [19" x 17" x 21" high]; one desk 1524mm wide x 762 deep (with keyboard tray retracted) x 762mm high [60" wide x 30" deep x 30" high]; and one desk chair 500mm wide x 535mm deep x 851mm high [19-1/2" x 21" x 33-1/2" high].

2-4.1.1.3 Minimum Finishes:
Floor: carpet
Base: resilient cove base.
Walls: gypsum wallboard with full-height Sisal Fabric wallcovering.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.1.1.4 Other requirements: Living/sleeping room shall have at least one exterior operable window with insect screen. Window shall meet egress requirements of NFPA 101 and Unified Facilities Criteria (UFC) 1-200-01 and International Building Code (IBC) 2000. Window shall not be located adjacent to an exterior corridor or breezeway. Door between service area and living/sleeping room shall have electronic lockset. Door between public corridor and service area shall have electronic lockset. Provide minimum of one combination telephone/data outlet in each Living /Sleeping room. Provide minimum of one cable television outlet in each Living/Sleeping room. Coordinate outlet locations with furniture arrangement. Refer to Chapter 9 Electrical Systems.

2-4.1.2 **Closet (CLOSET)**. Provide one per living/sleeping room.

2-4.1.2.1 Function: Private walk-in closet for clothing and storage of boxes and field gear.

2-4.1.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: rod and shelf, as indicated on the RFP Concept Drawings.

2-4.1.2.3 Minimum Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard
Ceiling: painted gypsum wallboard.

2-4.1.2.4 Other requirements: Door shall have passage function latchset and be equipped with a hasp so the occupant can provide his/her own padlock.

2-4.1.3 **Kitchen (KITCHEN)**. Provide one per module.

2-4.1.3.1 Function: Circulation space, food preparation area, and eating area for occupants.

2-4.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets.
The following item will be Contractor furnished and installed: minimum 1500 linear mm [5'-0"] of 600mm [2'-0"] deep kitchen base cabinets and countertop (including cooktop/range width), and 2100 linear mm [7'-0"] of 300mm [12"] deep wall cabinets. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-

0”] clear between countertop and bottom of wall cabinets at sink. Base cabinets shall have minimum of two 300 mm [12”] wide drawers; provide plastic laminate countertop with integral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1’-4” x 1’-4” x 7” deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8); provide fire extinguisher mounted inside base cabinet. One 4-burner electric cooktop, rangehood with exterior exhaust and garbage disposal shall be priced separately as Option No. 2, see proposal Schedule, Section 00010.

2-4.1.3.3 Minimum Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard; Wall area between countertop and wall cabinets: plastic laminate.
Ceiling: painted gypsum wallboard.

2-4.1.3.4 Other requirements: Door between public corridor and service area (entry door into module) shall have interlocking threshold.

2-4.1.4 **Bathroom (BATHROOM)**. Provide one per module.

2-4.1.4.1 Function: Bathing and toilet facilities for either occupant; storage for both occupants’ bath articles.

2-4.1.4.2 Furnishings/Fixtures/Equipment (FFE): All the following items listed will be Contractor furnished and installed: Lavatory that shall be minimum 475mm x 475mm [19” x 19”] self-rimming vitreous china, or cast-filled acrylic or solid surfacing material integrally molded to countertop; provide chrome-plated washerless faucet with pop-up drain (refer to Chapter 8); Countertop shall be minimum 900mm [3’-0”] wide cast-filled acrylic, acrylic solid surfacing material, or plastic laminate with integrally molded, 100mm high coved backsplash. Provide 102mm high side splash at side walls. Provide plastic laminate surfaced vanity base cabinet with hinged door(s) and minimum two 225mm [9”] wide drawers. Provide 6mm [1/4”] thick x minimum 1050mm [3’-6”] high mirror glass, full width of vanity countertop, with wall mounted vanity light fixture above mirror (refer to Chapter 9). Provide one recessed medicine cabinet, two soap holders, two toothbrush/tumbler holders. Provide floor mounted toilet with full seat and seat cover (lid). Provide bathtub, chrome-plated brass showerhead, and anti-scald single-handle mixing valve (refer to Chapter 8). Provide two minimum 600mm [2’-0”] long towel bars mounted on walls outside tub/shower enclosure, two wall mounted soap holders in the tub/shower, and one door mounted robe hook with two hooks. Provide wall mounted retractable clothesline across tub/shower. Provide mildew-resistant vinyl shower curtain with stainless steel curtain hooks and chrome-plated brass shower curtain rod. Provide single roll toilet tissue dispenser.

2-4.1.4.3 Minimum Finishes:
Floor: ceramic tile
Base: ceramic tile sanitary cove base
Walls: full height ceramic tile. Walls around shower/tub enclosure shall be full height ceramic tile.
Ceiling: painted water resistant gypsum board.

2-4.1.4.4 Other requirements: HVAC system shall exhaust bathroom air; refer to Chapter 10. Door shall have privacy function lockset.

2-4.2 **Areas Comprising the <u>One-Person Living Unit</u> (Single Unit Module)**. Each One-Person living unit, or module, will contain a living/sleeping room with closet, a service area with Kitchen, and a bathroom. Spaces are as follows.

2-4.2.1 **Living/Sleeping Room (BEDROOM)**. Provide one per module.

2-4.2.1.1 Function: Private bedroom and living space for one senior enlisted person.

2-4.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: One twin bed with headboard and footboard 102mm x 2083mm [40" x 85"]; one entertainment center for occupant's television and sound system 864mm wide x 635mm deep x 1930mm high [34" x 25" x 76"]; one chest of drawers 712mm wide x 458mm deep x 661mm high [28" x 18" x 26" high]; one nightstand 485mm wide x 435mm deep x 535mm high [19" x 17" x 21" high]; one desk 1524mm wide x 762 deep (with keyboard tray retracted) x 762mm high [60" wide x 30" deep x 30" high]; and one desk chair 500mm wide x 535mm deep x 851mm high [19-1/2" x 21" x 33-1/2" high].

2-4.2.1.3 Minimum Finishes:
Floor: carpet
Base: resilient cove base
Walls: gypsum wallboard with full-height Sisal Fabric wallcovering
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.2.1.4 Other requirements: Living/sleeping room shall have at least one exterior operable window with insect screen. Window shall meet egress requirements of NFPA 101 and Unified Facilities Criteria (UFC) 1-200-01 and International Building Code (IBC) 2000. Window shall not be located adjacent to an exterior corridor or breezeway. Provide minimum of one combination telephone/data outlet on in each Living /Sleeping room. Provide minimum of one cable television outlet in each Living/Sleeping room. Coordinate outlet locations with furniture arrangement. Refer to Chapter 9 Electrical Systems.

2-4.2.2 **Closet (CLOSET)**. Provide one per living/sleeping room.

2-4.2.2.1 Function: Private walk-in closet for clothing and storage of boxes and field gear.

2-4.2.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: rod and shelf, as indicated on RFP Contract Drawings.

2-4.2.2.3 Minimum Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard or painted veneer plaster
Ceiling: painted gypsum wallboard.

2-4.2.2.4 Other requirements: Door shall have passage function latchset and be equipped with a hasp so the occupant can provide his/her own padlock.

2-4.2.3 **Kitchen (KITCHEN)**. Provide one per module.

2-4.2.3.1 Function: Circulation space, food preparation area, and eating area for occupant and visitors.

2-4.2.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets.
The following item will be Contractor furnished and installed: minimum 1500 linear mm [5'-0"] of 600mm [2'-0"] deep kitchen base cabinets and countertop (including cooktop/range width), and 2100 linear mm [7'-0"] of 300mm [12"] deep wall cabinets. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-0"] clear between countertop and bottom of wall cabinets at sink. Base cabinets shall have minimum of two 300 mm [12"] wide drawers; provide plastic laminate countertop with integral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1'-4" x 1'-4" x 7" deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8); provide fire extinguisher mounted inside base cabinet. One 4-burner electric cooktop, rangehood with exterior exhaust and garbage disposal shall be priced separately

as Option No. 2, see proposal Schedule, Section 00010.

2-4.2.3.3 Minimum Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard; Wall area between countertop and wall cabinets: plastic laminate.
Ceiling: painted gypsum wallboard.

2-4.2.3.4 Other requirements: Door between public corridor and service area (entry door into module) shall have interlocking threshold.

2-4.2.4 **Bathroom (BATHROOM)** . Provide one per module.

2-4.2.4.1 Function: Bathing and toilet facilities for occupant; storage for occupants' bath articles.

2-4.2.4.2 Furnishings/Fixtures/Equipment (FFE): All the following items listed will be Contractor furnished and installed: Lavatory that shall be minimum 475mm x 475mm [19" x 19"] self-rimming vitreous china, or cast-filled acrylic or solid surfacing material integrally molded to countertop; providechrome-plated washerless faucet with pop-up drain (refer to Chapter 8); Countertop shall be minimum 900mm [3'-0"] wide cast-filled acrylic, acrylic solid surfacing material, or plastic laminate with integrally molded, 100mm high coved backsplash. Provide 102mm high side splash at side walls. Provide plastic laminate surfaced vanity base cabinet with hinged door(s) and minimum two 225mm [9"] wide drawers. Provide 6mm [1/4"] thick x minimum 1050mm [3'-6"] high mirror glass, full width of vanity countertop, with wall mounted vanity light fixture above mirror (refer to Chapter 9). Provide one recessed medicine cabinet, two soap holders, two toothbrush/tumbler holders. Provide floor mounted toilet with full seat and seat cover (lid). Provide bathtub, chrome-plated brass showerhead, and anti-scald single-handle mixing valve (refer to Chapter 8). Provide two minimum 600mm [2'-0"] long towel bars mounted on walls outside tub/shower enclosure, two wall mounted soap holders in the tub/shower, and one door mounted robe hook with two hooks. Provide wall mounted retractable clothesline across tub/shower. Provide mildew-resistant vinyl shower curtain with stainless steel curtain hooks and chrome-plated brass shower curtain rod. Provide single roll toilet tissue dispenser.

2-4.2.4.3 Finishes:
Floor: ceramic tile
Base: ceramic tile sanitary cove base
Walls: full height ceramic tile. Walls around shower/tub enclosure shall be full height ceramic tile.
Ceiling: painted water resistant gypsum board.

2-4.2.4.3 Other requirements: HVAC system shall exhaust bathroom air; refer to Chapter 10. Door shall have privacy function lockset.

2-4.3 **BUILDING 356 and 358 UEPH COMMON AREAS**. Common areas will be shared by soldiers. Spaces are as follows:

2-4.3.1 **Entry Lobby**. Provide two per floor. Located across the Lanai from the Game Room.

2-4.3.1.1 Function: Primary entry point into the UEPH facility; waiting area for visitors.

2-4.3.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: four upholstered modular waiting-area seating units with two modular end table units. Seating shall accommodate 6 people.

2-4.3.1.3 Finishes:
Floor: vinyl composition tile.

Base: resilient cove base.
Walls: painted gypsum wallboard.
Ceiling: First and Second Floor ceiling: patch existing exposed ceiling to match existing adjacent and paint.
Third Floor ceiling: Suspended acoustic tile ceiling grid system.

2-4.3.1.4 Other requirements: Provide conduit and junction box for cable television service to wall or ceiling mounted television. Provide telephone outlet for public payphone.

2-4.3.2 **Lounge Area (LOUNGE)**. Provide one area per floor. The Lounge alcove space is open to interior corridor.

2-4.3.2.1 Function: Space for building occupants to relax.

2-4.3.2.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: minimum of six upholstered modular waiting-area seating units with two modular end table units. Seating shall accommodate 8 people. Provide ceiling or wall mounted television bracket with locking tray. Arrange seating to allow viewing of television (TV is government furnished, government installed). The following item will be Contractor furnished and installed: fire extinguisher in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-4.3.2.3 Finishes: Match adjacent Interior Corridor.

2-4.3.2.4 Other requirements: Provide conduit and junction box for cable television service to wall or ceiling mounted television. Provide telephone outlet for public payphone.

2-4.3.3 **Game Room (GAME ROOM)**. Provide two per floor. Provide area for vending machines and ice machine-dispensers.

2-4.3.3.1 Function: additional space for building occupants to entertain.

2-4.3.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. storage; one ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals; Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines. Vending machines will not require plumbing connections. Game machinesThe following item will be Contractor furnished and installed: fire extinguisher in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-4.3.3.3 Finishes:
Floor: vinyl composition tile.
Base: resilient cove base.
Walls: painted gypsum wallboard,
Ceiling: patch existing exposed ceiling to match existing adjacent and paint..

2-4.3.3.4 Other requirements: Provide a pair of 914 mm [3'-0"] wide entry doors. Provide electrical power to accommodate vending machines, game machines, and to comply with applicable codes.

2-4.3.4 **Men's Toilet (MEN)**. Provide two private toilet rooms per floor. Room shall be accessed from Game Room.

2-4.3.4.1 Function: Men's single-occupant toilet and lavatory.

2-4.3.4.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, one toilet seat cover dispenser; and toilet tissue dispenser.

2-4.3.4.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-4.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.5 **Women's Toilet (WOMEN)**. Provide two private toilet rooms per floor. Room shall be accessed from Game Room.

2-4.3.5.1 Function: Women's single-occupant toilet and lavatory.

2-4.3.5.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, one toilet seat cover dispenser; and toilet tissue dispenser.

2-4.3.5.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-4.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.6 **Janitor Closet (JAN)**. Provide three per floor.

2-4.3.6.1 Function: Service Sink, and storage of cleaning supplies.

2-4.3.6.2 Furnishings/Fixtures/Equipment: the following items will be Contractor furnished and installed: floor mop sink, mop rack for three mops, and minimum 1829 linear mm of wall mounted stainless steel shelving.

2-4.3.6.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base.
Walls: painted water-resistant gypsum wallboard, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.3.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-4.3.7 **Laundry Area(s) (LAU)**. Provide one per floor. Provide one clothes washer per 12 soldiers, and one clothes dryers per 8 soldiers (round fractional numbers to the next highest whole number). Provide minimum of one laundry room on each floor of the UEPH facility. Provide minimum five washers and seven dryers in each room.

2-4.3.7.1 Function: Self-service washers and dryers and clothes folding areas for residents.

2-4.3.7.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: commercial quality clothes washers and dryers (each minimum 2.5 cubic feet capacity), non-coin

operation; Stacked dryers are preferred; Appliances shall be Energy Star compliant; two vandal-resistant waiting chairs per each four washers. The room shall accommodate one wall mounted laundry product vending machine in each laundry room.
The following item will be Contractor furnished and installed: minimum 1800 linear mm [6'-0"] of 600 mm [2'-0"] deep base cabinets and countertops for folding clothes; provide one each service sink.

2-4.3.7.3 Finishes:
Floor: quarry tile
Base: quarry tile
Walls: painted water resistant gypsum wallboard, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.3.7.4 Other requirements: Conceal utilities from view, but provide easy maintenance access; locate utility connections 914 mm [36"] above finish floor, unless otherwise recommended by manufacturer. Provide one floor drain for every four washers; locate outside of traffic area. Provide venting of dryer exhaust as on RFP Concept Drawings with lint catchment system. Lint catchment system shall be designed to be maintained within the Laundry Room. Partitions around laundry rooms shall extend to underside of floor above. Provide 914 mm [3'-0"] wide door(s) into room.

2-4.4 **BUILDING 356 and 358 UEPH SUPPORT AREAS**. Support areas include circulation spaces such as stairs and corridors, mechanical, electrical, and communications spaces. Spaces are as follows:

2-4.4.1 **Interior Corridor**. Provide as required to allow circulation to building spaces, and comply with applicable code egress requirements. Due to security, climate, and force protection concerns, interior corridors are the preferred means of circulation between living units and other building spaces.

2-4.4.1.1 Function: Circulation and means of egress.

2-5.4.1.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. The following items will be Contractor furnished and installed: fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-4.4.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base.
Walls: painted finish.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint. Suspended acoustic tile ceiling grid system at Third Floor.

2-5.4.1.4 Other requirements: Handicap accessible.

2-4.4.2 **Exterior Corridor (LANAI).** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Allow circulation to building spaces. Exterior corridor shall comply with applicable code egress requirements. Exterior corridors provide link with stairs and other circulation components. Exterior corridors shall not be used to provide access to living units

2-4.4.2.1 Function: Circulation and means of egress.

2-5.4.2.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. The following items will be Contractor furnished and installed: fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

2-4.4.2.3 Finishes:
Floor: sealed concrete
Base: Exterior wall material
Walls: Exterior wall material
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.2.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

2-4.4.3 **Exterior Stairs**. required to allow circulation to upper floors of the building, and to comply with applicable code egress requirements. This description covers all Exterior Stairs for Building 356 and 358.

2-4.4.3.1 Function: Circulation and means of egress.

2-4.4.3.2 Furnishings/Fixtures/Equipment (FFE):

2-4.4.3.3 Finishes: Landing floor: sealed concrete with slip-resistant finish texture.
Base: Exterior wall material
Treads: Sealed concrete with slip-resistant finish texture. Provide slip-resistant nosing.
Risers: sealed concrete.
Walls: exterior wall materials
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.3.4 Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railings shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-4.4.4 **Mechanical Areas (MECH)**. Provide dedicated interior spaces and exterior areas for plumbing, fire protection, and HVAC equipment. Size and locate rooms to allow equipment removal and maintenance Provide floor openings and vertical shaft spaces as necessary.

2-4.4.4.1 Function: Mechanical support spaces for the UEPH building.

2-4.4.4.2 Furnishings/Fixtures/Equipment: None.

2-4.4.4.3 Finishes:
Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.4.4 Other requirements: Locate air intake and exhaust openings to provide optimum indoor air quality. Roof mounted equipment shall not be used. Provide masonry screen walls with lockable metal access gates around outdoor equipment areas (refer to Chapter 3); comply with force protection standards. Doors shall have storeroom function lockset master-keyed to existing system.

2-4.4.5 **Electrical Rooms (ELEC)**. Provide dedicated interior spaces and exterior areas for electrical equipment. Rooms shall allow easy equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-4.4.5.1 Function: Electrical support spaces for the UEPH building.

2-4.4.5.2 Furnishings/Fixtures/Equipment: None.

2-4.4.5.3 Finishes:
Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.5.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing system. .

2-4.4.6 **Telecommunication Room (TELE)**. Provide dedicated interior rooms for communication equipment. Rooms shall allow easy equipment removal and maintenance.

2-4.4.6.1 Function: Telephone and data network support spaces for the UEPH building.

2-4.4.6.2 Furnishings/Fixtures/Equipment: As required by Statement of Work.

2-4.4.6.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.6.4 Other requirements: Communication service to the building shall be underground. Provide minimum 914 mm [3'-0"] wide door with storeroom function lockset master-keyed to existing system. . Provide floor openings and vertical shaft spaces as necessary. Provide a minimum of three 102 mm [4"] diameter empty conduits between vertically stacked communication rooms.

2-4.4.7 **Utility/Cor (UTIL/COR)**. Provide two areas per floor.

2-4.4.7.1 Function: Space for building utilities

2-4.4.7.2 Furnishings/Fixtures/Equipment: None.

2-4.4.7.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-4.4.7.4 Other requirements: Provide 914 mm [3'-0"] wide door with storeroom function lockset.

## 2-5 BUILDING 357 - DINING FACILITY FUNCTIONAL AND AREA REQUIREMENTS.

The dining facility for enlisted personnel will employ cafeteria-style service and will be equipped to allow for service of both full menu and short order, fast food types of meals, carry-out and ala carte.

The Dining Facility will be constructed on the ground floor of Building 357. The minimum seat count for the facility is 374 people per seating. The Design-Build Offeror shall verify and adjust room layout to ensure that the minimum number of tables/seats is accounted for. Major functional areas include Dining, Kitchens, serving and sit down dining, dish washing, employee lockers and toilets, food preparation and cooking, garbage and trash disposal, non-provisional storage, patron toilets, office(s), pot and pan washing, receiving platform, refrigerated and dry storage, serving, and signature-head count, cashier station(s), and staging area. Space for entry

canopies for climate control and receiving platforms are included in this project.

Final Dining Facility Design shall be coordinated and approved by The Army Community of Excellence, Subsistence (ACES); The Design-Build offeror should contact Goldie Bailey (tel. 804-734-3354).

2-5.1 **Dining Facility Food Service Areas.** Public areas where food is displayed, purchased, and consumed.

2-5.1.1 **Dining Area (DINING AREA#1, #2,#3, #4, AND #5).** Provide four separate areas as indicated on the first floor Provide one additional dining area on the second floor.

2-5.1.1.1 Function: Dining area for soldiers.

2-5.1.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and seating for a minimum of 300 people. Also, see RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items will be Government or Contractor furnished and installed.

2-5.1.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard and painted concrete wall.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.1.4 Other requirements: Room shall have exterior window. Provide a pair of historic doors as required. Provide exit devices as required by code.

2-5.1.2 **Beverage/Condiment Area & Salad/Hot Bar(BEVERAGES/CONDIMENTS and Salad/Hot Bar).** Provide one as indicated.

2-5.1.2.1 Function: Food service area for soldiers.

2-5.1.2.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.2.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.3 **Short Order Area, Specialty Cooking, and Service Line (SHORT ORDER, SPECIALTY COOKING, AND SERVICE LINE).** Provide one area per function as indicated.

2-5.1.3.1 Function: Food service area for soldiers.

2-5.1.3.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.3.3 Finishes:

Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.3.4 Other requirements: Room shall have exterior window.

2-5.1.4 **Snack Bar (SNACK BAR).** Provide one as indicated.

2-5.1.4.1 Function: Food service area for soldiers.

2-5.1.4.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.4.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.4.4 Other requirements: Room shall have exterior window. Provide a pair of historic doors as required; door shall have hold open device and entry function lockset.

2-5.1.5 **Snack Storage (SNACK STORAGE).** Provide one as indicated.

2-5.1.5.1 Function: Snack Bar storage.

2-5.1.5.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.5.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.6 **Check-In (CHECK-IN).** Provide one as indicated.

2-5.1.6.1 Function: Main entry point into the Dining Facility for soldiers and guests. Location of cashier, tray dispenser, and electronic menu board.

2-5.1.6.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.1.6.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.1.6.4 Other requirements: Provide a pair of historic doors as required.

2-5.2 **DINING FACILITY WORK AREAS** Non-Public areas where food preparation, storage, cleaning, and receiving occur.

2-5.2.1 **Dishwash Room (DISHWASH RM).** Provide one as indicated.

2-5.2.1.1 Function: sanitary area for the cleaning of dining dishware and utensils.

2-5.2.1.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.1.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic wall tile
Ceiling: suspended fiberglass panel ceiling.

2-5.2.1.4 Other requirements: Room shall have exterior window. Provide a pair of 914 mm [3'-0"] wide hollow metal doors; door shall have hold open device and entry function.

2-5.2.2 **Kitchen and Bakery Preparation (KITCHEN / BAKERY PREP).** Provide one as indicated.

2-5.2.2.1 Function: sanitary area for food preparation.

2-5.2.2.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.2.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.2.4 Other requirements: Room shall have exterior window. Provide a pair of 914 mm [3'-0"] wide hollow metal passage doors to adjoining Short Order area.

2-5.2.3 **Refrigerator/Freezer Space (REFRIGERATOR/FREEZER).** Provide one as indicated.

2-5.2.3.1 Function: Cold storage of food items.

2-5.2.3.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.3.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.4 **Pots & Pan Washing (POT & PAN WASHING).** Provide one as indicated.

2-5.2.4.1 Function: sanitation area for the cleaning of cooking equipment.

2-5.2.4.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.4.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.5 **Pots & Pan Racks (POT & PAN RACKS).** Provide one as indicated.

2-5.2.5.1 Function: storage area for cooking equipment.

2-5.2.5.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.5.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.6 **Dry Storage (DRY STORAGE).** Provide one as indicated.

2-5.2.6.1 Function: storage space

2-5.2.6.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.6.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.7 **Field Feeding Storage (FIELD FEEDING STORAGE).** Provide one as indicated.

2-5.2.7.1 Function: storage space

2-5.2.7.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.7.3 Finishes:
Floor: quarry tile, non-slip finish

Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.7.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.8 **Ice Machine Room (ICE MACH / COFFEE RM).** Provide one as indicated.

2-5.2.8.1 Function: ice making, beverage, and dessert preparation space.

2-5.2.8.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.8.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.8.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.2.9 **Kitchen Work Area Corridors.** Provide as required.

2-5.2.9.1 Function: Provide as required to allow circulation to kitchen spaces, and comply with applicable code egress requirements.

2-5.2.9.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.9.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.10 **Receiving (RECEIVING)** Provide as required.

2-5.2.10.1 Function: area for the receipt and temporary storage of equipment and products.

2-5.2.10.2 Furnishings/Fixtures/Equipment: See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.2.10.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: ceramic tile
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.2.11 **Electric Panel (ELECT PANEL RM).** Provide one dedicated interior space for electrical equipment. Size and locate rooms to allow equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-5.2.11.1 Function: Electrical support spaces for the Dining Facility.

2-5.2.11.2 Furnishings/Fixtures/Equipment: None.
2-5.2.11.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum wallboard
Ceiling: painted underside of structure above

2-5.2.11.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing system.

2-5.3 **DINING FACILITY ADMINISTRATION AREAS.** Non-Public areas where offices for the facility management occur.

2-5.3.1 **Manager's Office (MGR OFFICE).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.1.1 Function: Private office for facility manager.

2-5.3.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-5.3.1.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum board
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable. Provide One-Way window in wall between Office and Short Order space.

2-5.3.2 **Office (OFFICE).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.2.1 Function: Private office

2-5.3.2.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-5.3.2.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum board
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-5.3.3 **Vendor Office (VEN OFF).** Provide one as indicated. Occupants: 1, and occasional visitors.

2-5.3.3.1 Function: Private office

2-5.3.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-5.3.3.3 Finishes:
Floor: quarry tile, non-slip finish
Base: quarry tile
Walls: painted gypsum board
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.3.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-5.3.4 **Men's Staff Toilet (STAFF TOILET)**. Provide one toilet room. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of lockers and plumbing fixtures as indicated in the table below.

**Table 2-5.3.4 Locker Room Plumbing Fixture and Locker Quantities**

| | STAFF TOILET | |
|---|---|---|
| | **MEN** | **WOMEN** |
| **Lockers** | 10 | 10 |
| **Toilets** | 1 | 2 |
| **Urinals** | 1 | - |
| **Lavatories** | 2 | 2 |

2-5.3.4.1 Function: Men's single-occupant toilet and lavatory, for use by staff.

2-5.3.4.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.3.4.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted gypsum wallboard.

2-5.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.3.5 **Women's Staff Toilet (STAFF TOILET)**. Provide one toilet room. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of lockers and plumbing fixtures as indicated in table 2-6.3.4.

2-5.3.5.1 Function: Women's single-occupant toilet and lavatory, for use by staff.

2-5.3.5.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.3.5.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted gypsum wallboard.

2-5.3.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.4 **DINING FACILITY SUPPORT AREAS** . Support areas include circulation spaces such as stairs and corridors; mechanical, electrical, storage, and communications spaces. Spaces are as follows:

2-5.4.1 **Can Wash (CAN WASH)**. Provide one as indicated

2-5.4.1.1 Function: sanitation area for food products.

2-5.4.1.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.1.3 Finishes:
Floor: concrete with hardener and sealer.
Base: none.
Walls: exterior wall material
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.2 **Comp. Room (COMP RM)**. Provide one as indicated

2-5.4.2.1 Function: mechanical space for refrigerator and freezer conditioning units.

2-5.4.2.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.2.3 Finishes:
Floor: concrete with hardener and sealer.
Base: none.
Walls: painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.3.4 Other requirements: Provide pair of 914 mm [3'-0"] wide entry doors.

2-5.4.3 **Extractor Room (EXTRACTOR RM)**. Provide one as indicated

2-5.4.3.1 Function: mechanical space.

2-5.4.3.2 Furnishings/Fixtures/Equipment (FFE): See RFP Concept Design Drawings-Food Service Equipment Schedule sheet nos. K-1 through K-8, in conjunction with the Food Service Equipment List referenced in Attachment 12 to determine which items are Government or Contractor furnished and installed.

2-5.4.3.3 Finishes:
Floor: concrete with hardener and sealer.
Base: none.
Walls: painted concrete masonry units

Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.4.3.4 Other requirements: Provide pair of 914 mm [3'-0"] wide entry doors.

2-5.4.4 **Loading Dock (LOADING DECK)**

2-5.4.4.1 Function: area for the delivery of equipment and food products.

2-5.4.4.2 Furnishings/Fixtures/Equipment (FFE): None.

2-5.4.4.3 Finishes:
Floor: concrete with hardener and sealer.
Base: none.
Walls: painted concrete masonry units
Ceiling: painted underside of structure.

2-5.4.5 **Hand Wash (HAND WASH).** Area for Dining Facility customers to sanitize themselves before entering the Check-In area of the Dining Facility.

2-5.4.5.1 Function: wash area for Dining Facility customers.

2-5.4.5.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical systems to comply with applicable codes. The following items will be Contractor furnished and installed: wall-hung hand wash sink (8 stations total)

2-5.4.5.3 Finishes:
Floor: sealed concrete
Base: Exterior wall material on concrete masonry unit.
Walls: Exterior wall material on concrete masonry unit.
Ceiling: Provide painted covered roof structure

2-5.5 **SUPPORT AREAS**. Support areas include circulation spaces such as stairs and corridors; mechanical, electrical, and communication spaces; restroom facilities. Spaces are as follows:

2-5.5.1 **Exterior Corridor.** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements. Exterior corridors provide link to stairs and other circulation components.

2-5.5.1.1 Function: Circulation and means of egress.

2-5.5.1.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

2-5.5.1.3 Finishes:
Floor: sealed concrete
Base: Exterior wall material
Walls: Exterior wall material
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.1.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

2-5.5.2 **Exterior Stairs**. Provide as required to allow circulation to upper floors of the building. Stairs shall comply with applicable code egress requirements. This description covers all Exterior Stairs at for Building 357.

2-5.5.2.1 Function: Circulation and means of egress.

2-5.5.2.2 Furnishings/Fixtures/Equipment (FFE):

2-5.5.2.3 Finishes: Landing floor: sealed concrete with slip-resistant finish texture.
Base: exterior wall material
Treads: Sealed concrete with slip-resistant finish texture. Provide slip-resistant nosing.
Risers: sealed concrete.
Walls: exterior wall materials
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.2.4 Other requirements: Stairs shall comply with handicap accessibility requirements of applicable codes. Railings shall be designed in accordance with applicable codes. Refer to Chapter 5 for hardware and security requirements for exterior doors.

2-5.5.3 **Mechanical Areas (MECH)**. Provide dedicated interior spaces and exterior areas for plumbing, fire protection, and HVAC equipment. Room shall allow easy equipment removal and maintenance Provide floor openings and vertical shaft spaces as necessary.

2-5.5.3.1 Function: Mechanical support spaces for the UEPH building.

2-5.5.3.2 Furnishings/Fixtures/Equipment: None.

2-5.5.3.3 Finishes:
Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.3.4 Other requirements: Locate air intake and exhaust openings to provide optimum indoor air quality. Roof mounted equipment shall not be used. Provide masonry screen walls with lockable metal access gates around outdoor equipment areas (refer to Chapter 3); comply with force protection standards. Doors shall have storeroom function locksets master-keyed to existing systems.

2-5.5.4 **Electrical Rooms (ELEC)**. Provide dedicated interior spaces and exterior areas for electrical equipment. Allow equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-5.5.4.1 Function: Electrical support spaces for the UEPH building.

2-5.5.4.2 Furnishings/Fixtures/Equipment: None.

2-5.5.4.3 Finishes:
Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.4.4 Other requirements: Electrical service to the building shall be underground. Door shall have storeroom function lockset master-keyed to existing systems..

2-5.5.5 **Telecommunication Room (TELE)**. Provide dedicated interior rooms for communication equipment. Room shall allow easy equipment removal and maintenance. Provide minimum of two communication room per floor.

2-5.5.5.1 Function: Telephone and data network support spaces for the UEPH building.

2-5.5.5.2 Furnishings/Fixtures/Equipment: None.

2-5.5.5.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-5.5.5.4 Other requirements: Communication service to the building shall be underground. Provide minimum 914 mm [3'-0"] wide door with storeroom function lockset master-keyed to existing systems.. Provide floor openings and vertical shaft spaces as necessary. Provide a minimum of three 102 mm [4"] diameter empty conduits between vertically stacked communication rooms.

2-5.5.6 **Men's Public Toilet (MEN)**. Provide one toilet room on the ground floor. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of plumbing fixtures as indicated in table 2-6.5.6.

**Table 2-5.5.6 Toilet Room Plumbing Fixture Quantities**

| | PUBLIC TOILET | |
|---|---|---|
| | **MEN** | **WOMEN** |
| **Toilets** | 2 | 3 |
| **Urinals** | 1 | - |
| **Lavatories** | 3 | 3 |

2-5.5.6.1 Function: Men's single-occupant toilet and lavatory, for use by staff and visitors.

2-5.5.6.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.5.6.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted gypsum wallboard.

2-5.5.6.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-5.5.7 **Women's Public Toilet (WOMEN)**. Provide one toilet room on the ground floor. Room shall be sized to comply with handicap accessibility requirements. Provide the quantity of plumbing fixtures as indicated in table 2-6.5.6.

2-5.5.7.1 Function: Women's single-occupant toilet and lavatory, for use by staff and visitors.

2-5.5.7.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets and wall-hung lavatories; toilet partitions at each toilet; the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door; and toilet seat cover dispenser per compartment.

2-5.5.7.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted gypsum wallboard.

2-5.5.7.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

**2-6 BUILDING 357 - SOLDIER SERVICES FUNCTIONAL AND AREA REQUIREMENTS**. Soldier services occur on the second floor of Building 357. Soldier services are unrelated to other battalion administration functions.

2-6.1 **SOLDIER SUPPORT SERVICES.** Spaces covered under this paragraph shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.1.1 **Chaplain (CHAP)**. Provide four on the second floor. Occupants: 1, and visitors.

2-6.1.1.1 Function: Private office for Chaplain and visitors.

2-6.1.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, four side chairs, and one desk chair.

2-6.1.1.3 Finishes:
Floor: carpet
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.2 **Chaplain's Assistant (ASST CHAP)**. Provide four on the second floor. Occupants: 1, and visitors.

2-6.1.2.1 Function: Private office for Chaplain's Assistant and visitors.

2-6.1.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two side chairs, and one desk chair.

2-6.1.2.3 Finishes:
Floor: carpet
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.3 **Chaplain Waiting (WAITING)**. Provide as indicated on the second floor.

2-6.1.3.1 Function: waiting area for visitors to Chaplain services.

2-6.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: eight side chairs, two end tables, and magazine rack.

2-6.1.3.3 Finishes:
Floor: carpet
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.4 **Toilet (TOILET)**. Provide as indicated on the second floor. Occupants: 1, and visitors.

2-6.1.4.1 Function: single-occupant toilet and lavatory, for use by staff.

2-6.1.4.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: floor mounted toilet and wall-hung lavatory; the following toilet accessories: one mirror with shelf; one paper towel dispenser/waste receptacle; one soap dispenser; one toilet tissue dispenser; one toilet seat cover dispenser, robe hook on door; and toilet seat cover dispenser.

2-6.1.4.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-6.1.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.1.5 **Legal Office (LEGAL).** Provide four on the second floor.

2-6.1.5.1 Function: Private office.

2-6.1.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.1.5.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.1.5.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-6.1.3 **Legal Waiting (WAITING)**. Provide as indicated on the second floor.

2-6.1.3.1 Function: waiting area for visitors to Chaplain services.

2-6.1.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed:

eight side chairs, two end tables, and magazine rack.

2-6.1.3.3 Finishes:
Floor: carpet
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2 **TROOP AID STATION.** Spaces covered under this paragraph, with the exception of Storage Spaces shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.2.1 **Medical Office (Med Office)**

2-6.2.1.1 Function: open office area.

2-6.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: four desks with return, four bookcase, four legal-size four-drawer file cabinets, eight side chair and four desk chairs.

2-6.2.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.1.4 Other requirements: Provide historic doors as required. Room shall have exterior window.

2-6.2.2 **Doctor's Office (DR. OFF.)**

2-6.2.2.1 Function: Private office.

2-6.2.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-6.2.3 **Non-Commissioned Officer In Charge (NCOIC)**

2-6.2.3.1 Function: Private office.

2-6.2.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.3.3 Finishes:

Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.4 **Physician's Assistant (PHY ASST)**

2-6.2.4.1 Function: Private office.

2-6.2.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair and one desk chair.

2-6.2.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.2.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.5 **Working Storage (WORKING STOR)**

2-6.2.5.1 Function: Storage space.

2-6.2.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-6.2.5.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.2.5.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.2.6 **Deployment Storage (DEPLOY STOR)**

2-6.2.6.1 Function: Storage space.

2-6.2.6.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-6.2.6.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.2.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3 **SOLDIER COMMUNITY FUNCTIONS.** Soldier Community areas are social gathering and recreational spaces. It includes functions like mail boxes, kitchen, and office space. These areas provide a place for relaxation and social interaction in an informal setting. Spaces covered under this paragraph, with the exception of office, front desk, mailroom, janitor's closet, and storage rooms, shall be made accessible for handicapped persons in accordance with Chapter 5, paragraph 5-9.

2-6.3.1 **Activity (ACTIVITY)** Provide one on the second floor.

2-6.3.1.1 Function: Soldier entertainment area.

2-6.3.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants, game machines, and billiard table.

2-6.3.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-6.3.2 **Sitting Room (SITTING RM)** Provide one on the second floor.

2-6.3.2.1 Function: entertainment area for Soldiers' and visitors.

2-6.3.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants.

2-6.3.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.2.4 Other requirements: Provide 1829 mm [6'-0"] wide doors into room.

2-6.3.3 **TV Lounge (TV LOUNGE)** Provide one on the second floor.

2-6.3.3.1 Function: entertainment area for Soldiers' and visitors.

2-6.3.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: seating for up to 25 occupants, large screen television, videotape and DVD player.

2-6.3.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.3.4 Other requirements:

2-6.3.4 **Kitchen (KITCHEN)** Provide one on the second floor.

2-6.3.4.1 Function: Soldier cooking area.

2-6.3.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one refrigerator-freezer (minimum 9 total cubic feet); one microwave oven (min .9 cubic feet, 800 watts) mounted under wall cabinets; one dining table for two persons, 750mm square x 725mm high [30" x 28-1/2" high] with two armless dining chairs; one 4-burner electric range with self-cleaning oven.
The following items will be Contractor furnished and installed: ; one range hood with exterior exhaust; provide 600mm [2'-0"] deep kitchen base cabinets and countertop in the amount as indicated on the Concept Design Drawing , and 3658 linear mm [12'-0"] of 300mm [12"] deep wall cabinets at interior wall. Wall cabinets shall be minimum 600mm [2'-0"] high; provide 600 mm [2'-0"] clear between countertop and bottom of wall cabinets. Base cabinets shall have minimum of two 300 mm [12"] wide drawers. Provide plastic laminate countertop with intergral side and backsplashes at walls. Provide single compartment, stainless steel kitchen sink with food strainer/stopper, minimum inside dimensions 400mm x 400mm x 175mm deep [1'-4" x 1'-4" x 7" deep], with chrome-plated, single handle, washerless mixing faucet (refer to Chapter 8). Provide fire extinguisher mounted above base cabinet.

2-6.3.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.4.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-6.3.5 **Vending Area (VENDING).** Provide minimum one area on the second floor..

2-6.3.5.1 Function: Space for soft drink and snack vending machines, and ice machine-dispenser.

2-6.3.5.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. Storage; ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals. Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines. Vending machines will not require plumbing connections.

2-6.3.5.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.5.4 Other requirements: Provide electrical power to accommodate vending machines and to comply with applicable codes.

2-6.3.6 **Office (OFFICE)**. Provide one on the second floor. Room shall be accessed through the Front Desk. Occupants: 1

2-6.3.6.1 Function: Private office for manager.

2-6.3.6.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, two side chairs and one desk chair.

2-6.3.6.3 Finishes:
Floor: carpet

Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-6.3.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3.7 **Front Desk (FRONT DESK)**. Provide one on the second floor. Occupants: 1, and occasional visitors.

2-6.3.7.1 Function: Visual Control of entrances, exits, and Soldier Community Functional Areas.

2-6.3.7.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one legal-size four-drawer file cabinets, one desk chair. The following items will be Contractor furnished and installed: Provide counter (built-in casework), per Concept Design Drawings, separating the Front Desk from the Sitting Room Corridor. The counter on the corridor side shall be minimum 1016 mm [3'-4"] high x 305 mm [12"] deep. The counter on the Front Desk side shall be minimum 762 mm [2'-6"] high x 610 mm [2'-0"] deep. The desk shall accommodate computer and monitor (not in contract), and writing area. Provide task lighting at all writing surfaces. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts.

2-6.3.7.3 Finishes:
Floor: carpet
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.7.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-6.3.8 **Public Telephone Area (PHONES)**. Provide one on the second floor.

2-6.3.8.1 Function: Pay telephones for barracks occupants and visitors.

2-6.3.8.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: three pay telephones and telephone stations. Offeror shall contract with local telephone company or other telephone service provider to furnish and install pay telephones; rate charged for calls shall not exceed the average prevailing rate in the local off-post community. Each station will have divider panels to enhance acoustical privacy. Provide built-in seating at two stations; third station shall be wheelchair accessible. Provide capability to mount portable TDD at one station. Materials shall be vandal resistant and easily cleaned.

2-6.3.8.3 Finishes: Match Sitting Room.

2-6.3.8.4 Other requirements: Handicap accessible.

2-6.3.9 **Mail Room (MAIL ROOM)**. Provide one on the second floor. Room shall be sized to allow access to all rear-loading mailboxes and parcel lockers. Provide minimum 1829 mm [6'-0"] clear between back of mailboxes and any obstructions. To comply with force protection minimum standards, avoid routing key utilities (including communications, fire detection and alarm, water mains, etc.) through or on common walls to mail room.

2-6.3.9.1 Function: Secure area for sorting incoming mail and distributing to rear-loading mailboxes.

2-6.3.9.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: Provide plastic laminate-faced sorting counter (built-in casework) 762 mm [2'-6"] deep x 914 mm [3'-0"] high and length as indicated on Concept Design Drawings. Provide United States Postal Service approved mailbox for each resident of the facility. Provide minimum of nine parcel lockers, and one outgoing mail collection box.

2-6.3.9.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.3.9.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall be handicap accessible. Design shall comply with United States Postal Service regulations.

2-6.3.10 **Common Toilet (T)**. Provide two toilet rooms on the second floor within the Soldier Community space. Room shall be sized to comply with handicap accessibility requirements.

2-6.3.10.1 Function: Men's single-occupant toilet and lavatory, for use by staff and visitors.

2-6.3.10.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: Provide floor mounted toilets and wall-hung lavatories. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser; one toilet seat cover dispenser per toilet, robe hook on each toilet partition door.

2-6.3.10.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-6.3.10.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-6.3.11 **Janitor Closet (JAN)**. Provide one on the third floor. Room shall be accessed from Sitting Room.

2-6.3.11.1 Function: Sink and storage of cleaning supplies, soap, and paper products.

2-6.3.11.2 Furnishings/Fixtures/Equipment (FFE): Provide one floor mounted mop sink, mop rack for three mops, and minimum 1524 linear mm of wall mounted stainless steel shelving.

2-6.3.11.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted water-resistant gypsum wallboard
Ceiling: painted gypsum wallboard

2-6.3.12 **Storage (ST)**. Provide one on the second floor. Room shall be accessed from Sitting Room.

2-6.3.12.1 Function: storage.

2-6.3.12.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Government furnished and installed: portable shelving.

2-6.3.12.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.4 **Classroom Areas**. Provide one group of classrooms on the second and third floor of Building 357. Classrooms will be accessed from the exterior corridor (Lanai).

2-6.4.1 **Classroom (CLASSROOM)**. Each classroom allows direct access from the exterior corridor (Lanai), and direct egress out of the building.

2-6.4.1.1 Function: Soldier training and other meetings.

2-6.4.1.2 Furnishings/Fixtures/Equipment: None.

2-6.4.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-6.4.1.4 Other requirements: Provide pair of 914 mm [3'-0"] wide Historic doors as required.

**2-7 BUILDING 357 - BATTALION HEADQUARTERS (HQ) FUNCTIONAL AND AREA REQUIREMENTS.** One Large Battalion HQ is located on the third floor of Building 357. The Battalion HQ shall consist of administrative areas, classrooms, and support spaces. A portion of the Battalion HQ functions will occur on the second floor of Building 357; specifically, they are the soldier support services (chaplain and legal) areas, and troop aid station. One elevator is required for Building 357. Mechanical and electrical systems must provide the battalion with independent operation and control.

Leadership and staff will manage the organization, receive visitors, and conduct the business of the battalion from the administrative areas (Command section, S-1, S-2, S-3, and S-4). Soldiers will visit the facility to conduct administrative business, or attend training classes. Military personnel will staff the facility; military and non-military personnel will visit the facility to meet with leadership or attend meetings. Although only able-bodied military personnel will be on staff, all spaces except shower rooms, and utility areas (janitor closets, mechanical, electrical, communication, and elevator machine rooms) shall comply with handicapped accessibility requirements, see Chapter 5, paragraph 5-9. Functions and areas are as follows:

2-7.1 **Command Section**. Provide one group of offices on the third floor, with accompanying administration area and reception area.

2-7.1.1 **Commanding Officer (CO)**. Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.1.1 Function: Private office for battalion commanding officer.

2-7.1.1.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk, one credenza, one bookcase, two legal-size four-drawer file cabinets, one conference table, six side chairs, and one desk chair.

2-7.1.1.3 Finishes:

Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.1.2 **Executive Officer (XO)**. Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.2.1 Function: Private office for battalion executive officer.

2-7.1.2.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.1.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.1.3 **Command Sergeant Major (CSM)**. Provide one on the third floor. Occupants: 1, and occasional visitors.

2-7.1.3.1 Function: Private office for battalion command sergeant major.

2-7.1.3.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.1.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.1.4 **Duty Officer (DUTY OFF)**. Provide one on the third floor. Occupants: 1.

2-7.1.4.1 Function: Duty Officer will provide physical security of the building, and visual control of the entrances and lobby, as well as functioning as an information source for visitors.

2-7.1.4.2 Furnishings/Fixtures/Equipment: The following items shall Government furnished and installed: one desk with return, one legal-size four-drawer file cabinet, one side chair, and one desk chair.

2-7.1.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.4.4 Other requirements: Provide 914 mm [3'-0"] wide door into room; door shall have glass vision panel.

2-7.1.5 **Message Mail Center (MESS CTR)**. Provide one on the third floor.

2-7.1.5.1 Function: Mail sorting.

2-7.1.5.2 Furnishings/Fixtures/Equipment: The following item will be Contractor furnished and installed: counter (built-in casework), as indicated in the Concept Design Drawings, separating the Message Mail Center from the corridor. The counter on the corridor side shall be minimum 1524 mm [5'-0"] wide x 1016 mm [3'-4"] high x 305 mm [12"] deep; provide locking overhead roll-down door to secure the opening when unattended; roll-down door hood shall not be visible from corridor side. Counter material shall be plastic laminate

2-7.1.5.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.5.4 Other requirements: Provide 914 mm [3'-0"] wide door into room; door shall have entry function lockset and glass vision panel.

2-7.1.6 **Reception (RECEPT)**. Provide one on the third floor. Accommodates reception desk and waiting area.

2-7.1.6.1 Function: Control area for visitors

2-7.1.6.2 Furnishings/Fixtures/Equipment: The following items will be Contractor furnished and installed: Provide counter (built-in casework), as indicated in the Concept Design Drawings, separating the reception area from the control/waiting area. The counter on the corridor side shall be minimum 1524 mm [5'-0"] wide x 1016 mm [3'-4"] high x 305 mm [12"] deep; the counter on the Reception side shall be minimum 762 mm [2'-6"] high x 610 mm [2'-0"] deep. The desk shall accommodate computer and monitor (not in contract), and writing area. Provide built-in communication and power receptacles or grommets in desk top to access wall receptacles. Desk shall have knee space and minimum two cabinets with hinged doors, and two drawers. Drawers and cabinets shall have keyed locks. Desk components shall have plastic laminate countertop, drawer, and door fronts.

2-7.1.6.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.6.4 Other requirements: Provide 914 mm [3'-0"] wide door into room; door shall have entry function lockset and glass vision panel.

2-7.1.7 **Conference Room (CONF RM)**. Provide two on the third floor. Room shall be located to allow direct access from the Command Section/S-1 Section and CO Office. The conference rooms shall be divided by operable panel partitions and provided with appropriate entrances and exits to allow two rooms to be combined for use as one large classroom. Occupants: up to 26 persons.

2-7.1.7.1 Function: Conference room for battalion leadership, staff, and visitors. Functions will include staff meetings, hearings, disciplinary sessions, and training.

2-7.1.7.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: conference table and seating for up to 26 persons. Provide one marker board (minimum 2438 mm wide x 1219 mm high [8'-0" x 4'-0"]). The following item will be Contractor furnished and installed: recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]; operable partition.

2-7.1.7.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.7.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.1.8 **Coffee Area (COFFEE)**. Provide one on the third floor. Area shall have countertop with kitchen sink; comply with handicap accessibility requirements.

2-7.1.8.1 Function: Sink and space for coffee maker and supplies; for use by command section staff and visitors.

2-7.1.8.2 Furnishings/Fixtures/Equipment (FFE): the following items will be Contractor furnished and installed: Provide 610 mm deep [2'-0"] plastic laminate countertop by width (see Concept Design Drawings) with integral side and backsplash, single compartment stainless steel kitchen sink 457 x 457 x 203 mm deep [18" x 18" x 8"]. Provide 330 mm deep [13"] of wall cabinets; mounted to provide 610 mm clearance above countertop. Provide dedicated electrical receptacle for coffee maker.

2-7.1.8.3 Finishes:
Floor: vinyl composition tile.
Base: resilient base.
Walls: painted gypsum wallboard.
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.9 **Command Section Private Toilet (TOIL)**. Provide one private toilet room on the third floor S-1 Administration area. Room shall be sized to comply with handicap accessibility requirements. Room shall be accessed from Administrative Area Corridor.

2-7.1.9.1 Function: Uni-sex single-occupant toilet and lavatory; for use by staff and visitors.

2-7.1.9.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: one floor mounted toilet, one wall-hung lavatory with fixtures and fittings, mirror with shelf above lavatory, paper towel dispenser/waste receptacle, soap dispenser, toilet tissue dispenser, and one toilet seat cover dispenser.

2-7.1.9.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile wainscot 1219 mm high with painted water-resistant gypsum board above.
Ceiling: painted gypsum wallboard.

2-7.1.9.4 Other requirements: Provide 914 mm [3'-0"] wide entry door.

2-7.1.10 **Storage (ST)**. Provide one on the third floor.

2-7.1.10.1 Function: storage

2-7.1.10.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.1.10.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.1.10.4 Other requirements: provide 914 mm [3'-0"] wide door into room.

2-7.2 **S-1 Section**. Provide one group of offices on the third floor. Command Section shall be accessed through the S-1 Clerical/Central Files area.

2-7.2.1 **S-1 Officer (S-1 OFF)**. Provide one on the third floor. Room shall be accessed through the S-1 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.2.1.1 Function: Private office for S-1 officer.

2-7.2.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.2.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.2.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.2.2 **S-1 Clerical/Central Files (S-1)**. Provide one on the third floor. S-1 Clerical/Central Files shall be accessed from the exterior corridor. The area shall have direct access to S-1 and Command Section private offices, and reception area. Occupants: 7 staff and occasional visitors.

2-7.2.2.1 Function: Open office area for S-1 admin staff; access to S-1 and Command offices.

2-7.2.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: seven systems furniture workstations.

2-7.2.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.2.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable.

2-7.3 **Personnel and Administration Center (PAC)** Provide one group of offices on the third floor.

2-7.3.1 **PAC (OFF)**. Provide one on the third floor. Room shall be accessed through the PAC Open

Office area. Occupants: 1, and occasional visitors.

2-7.3.1.1 Function: Private office for PAC officer.

2-7.3.1.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.3.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.3.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.3.2 **PAC Clerical/Central Files (PAC)**. Provide one on the third floor. PAC Clerical/Central Files shall be accessed from the Reception Area. Occupants: 7 staff and occasional visitors.

2-7.3.2.1 Function: Open office area for PAC admin staff.

2-7.3.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: seven systems furniture workstations.

2-7.3.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.3.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.4 **S-2 SECTION**. Provide one group of offices on the third floor. In a two-story building locate S-2 Section on the second floor.

2-7.4.1 **S-2 Officer (OFF)**. Provide one on the third floor. Room shall be accessed through the S-2 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.4.1.1 Function: Private office for S-2 officer.

2-7.4.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return, one bookcase, two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.4.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard or painted veneer plaster
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.4.2 **Crypto Storage (CRYPTO)**. Provide one on the third floor.

2-7.4.2.1 Function: storage

2-7.4.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.4.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.2.4 Other requirements: provide 914 mm [3'-0"] wide door into each room.

2-7.4.3 **S-2 Clerical/Central Files (S-2)**. Provide one on the third floor. S-2 Clerical/Central Files shall be accessed from the lobby or corridor. The area shall have direct access to S-2 private offices, and the Secured Documents Vault. Occupants: 8 staff , and occasional visitors.

2-7.4.3.1 Function: Open office area for S-2 admin staff; access to other S-2 space.

2-7.4.3.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.4.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Exterior window is desirable. Minimum ceiling height 2642 mm [8'-8"].

2-7.4.4 **S-2 Storage (ST)**. Provide one on the third floor.

2-7.4.4.1 Function: storage

2-7.4.4.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.4.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.4.4.4 Other requirements: provide 914 mm [3'-0"] wide door into each room.

2-7.5 **S-3 SECTION**. Provide one group of offices on the third floor.

2-7.5.1 **S-3 Officer (OFF)**. Provide one on the third floor. Room shall be accessed through the S-3 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.5.1.1 Function: Private office for S-3 officer.

2-7.5.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed:

one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.5.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.5.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.5.2 **S-3 Clerical/Central Files (S-3)**. Provide one on the third floor. The area shall have direct access to S-3 private offices. Occupants: 8 staff , and occasional visitors.

2-7.5.2.1 Function: Open office area for S-3 admin staff; access to S-3 office.

2-7.5.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.5.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.5.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.6 **S-4 SECTION**. Provide one group of offices on the third floor. In a two-story building locate S-4 Section on the first floor.

2-7.6.1 **S-4 Officer (OFF)**. Provide one on the third floor. Room shall be accessed through the S-4 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.6.1.1 Function: Private office for S-4 officer.

2-7.6.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.6.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room. Room shall have exterior window.

2-7.6.2 **S-4 Clerical/Central Files (S-4)**. Provide one on the third floor. S-4 Clerical/Central Files shall be accessed from the lobby or corridor. The area shall have direct access to S-4 private offices. Occupants: 8 staff , and occasional visitors.

2-7.6.2.1 Function: Open office area for S-4 admin staff; access to S-4 office.

2-7.6.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.6.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.6.3 **S-4 Storage & Supplies (SUPP)**. Provide one on the third floor. Room shall be under control of, and accessed from, S-4/Clerical/Central Files area.

2-7.6.3.1 Function: Storage of miscellaneous equipment for S-4 Section.

2-7.6.3.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: portable shelving.

2-7.6.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base
Walls: painted gypsum wallboard or
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.6.3.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.7 **S-6 SECTION**. Provide one group of offices on the third floor.

2-7.7.1 **S-6 Officer (OFF)**. Provide one on the third floor. Room shall be accessed through the S-6 Clerical/Central Files area. Occupants: 1, and occasional visitors.

2-7.7.1.1 Function: Private office for S-6 officer.

2-7.7.1.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.7.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.7.1.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.7.2 **S-6 Clerical/Central Files (S-6)**. Provide one on the third floor. The area shall have direct access to S-6 private offices. Occupants: 8 staff , and occasional visitors.

2-7.7.2.1 Function: Open office area for S-6 admin staff; access to S-6 office.

2-7.7.2.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: eight systems furniture workstations.

2-7.7.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.7.2.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.8 **Equal Opportunity Office (EO)**. Provide one on the third floor. Room shall be accessed through the exterior corridor (Lanai). Occupants: 1, and occasional visitors.

2-7.8.1 Function: Private office EO officer.

2-7.8.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.8.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.8.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.9 **Siprnet Room (SIPRNET)**. Provide a Siprnet Room on the third floor. The construction of the Siprnet Room shall be similar to that of the Arms Vault, see paragraph 5-7.2. Coordinate with the authority having jurisdiction for specific construction requirements.

2-7.9.1 Function: Storage and issue of weapons.

2-7.9.2 Furnishings/Fixtures/Equipment: None.

2-7.9.3 Finishes:
Floor: sealed concrete
Base: none.
Walls: painted concrete.
Ceiling: painted concrete.

2-7.9.4 Other requirements: Provide 914 mm [3'-0"] wide hollow metal door into room.

2-7.10 **CLASSROOM AREAS**. Provide one group of classrooms for the battalion on the third floor of Building 357. Classrooms will be accessed from an interior corridor or exterior corridor (Lanai). The Classroom/L.R.C. and Classroom No. 2 shall be divided by operable panel partitions and provided with appropriate entrances and exits to allow two rooms to be combined for use as one large classroom.

2-7.10.1 **Classroom/Learning Resource Center (CLASSRM L.R.C.)**. Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.1.1 Function: Soldier training and other meetings.

2-7.10.1.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and

installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]
The following items will be Contractor furnished and installed: wall separating Classroom/L.R.C. and Classroom No.2 shall be operable panel partition with minimum STC rating as indicated in SOW Ch. 5. Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]; operable partition. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.1.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.10.2 **Classroom No. 2 (CLASSRM No. 2)**. Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.2.1 Function: Soldier training and other meetings.

2-7.10.2.2 Furnishings/Fixtures/Equipment: The room shall accommodate tables and chairs for up to 60 occupants; one lectern. Walls separating classrooms shall be operable panel partitions with minimum STC rating as indicated in SOW Ch. 5. Provide one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"] wall mounted pull-down projection screen Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment; identify whether equipment is to be contractor or government provided.

2-7.10.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.2.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room. Minimum ceiling height 2642 mm [8'-8"] at perimeter, 3048 mm [10'-0"] in main portion of room.

2-7.10.3 **Classroom No. 1 (CLASSRM No. 1)**. Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.3.1 Function: Soldier training and other meetings.

2-7.10.3.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]
The following items will be Contractor furnished and installed: Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.3.3 Finishes:
Floor: vinyl composition tile
Base: resilient base

Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.3.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.10.4 **Resource Center (RESOURCE CTR)**. Each classroom shall be located to allow direct access from the main corridor/lobby, and direct egress out of the building. Occupants: up to 60 persons in each room.

2-7.10.4.1 Function: Soldier training and other meetings.

2-7.10.4.2 Furnishings/Fixtures/Equipment: the following items will be Government furnished and installed: tables and chairs for up to 60 occupants; one lectern; one marker board (minimum 3658 mm wide x 1219 mm high [12'-0" x 4'-0"]) and one 2438 mm wide [8'-0"]
The following items will be Contractor furnished and installed: Provide recessed ceiling mounted, motorized projection screen; 2438 mm wide [8'-0"]. Coordinate with user and add requirements for cable television outlets, television support brackets, or other equipment.

2-7.10.4.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.10.4.4 Other requirements: Provide 914 mm [3'-0"] wide doors into room.

2-7.11 **Re-Enlist Office (RE-ENLIST)**. Provide one on the third floor. Room shall be accessed from the exterior corridor. Occupants: 1, and occasional visitors.

2-7.11.1 Function: Private office for re-enlistment personnel.

2-7.11.2 Furnishings/Fixtures/Equipment: the following item will be government furnished and installed: one desk with return , one bookcase , two legal-size four-drawer file cabinets, one side chair, and one desk chair.

2-7.11.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard
Ceiling: Suspended acoustic tile ceiling grid system.

2-7.11.4 Other requirements: Provide 914 mm [3'-0"] wide door into room.

2-7.12 **Battalion HQ Common Areas**. Provide the following Common areas for the Battalion HQ. Handicapped accessibility is required in all common areas except janitor closet and shower rooms.

2-7.12.1 **Lobby, Corridors, and Vestibules**. Provide as required to allow access to building spaces. Unless otherwise required, minimum width of main corridors providing access to classroom area shall not be less than 2438 mm [8'-0"]; minimum width of other main corridors shall not be less than 1829 mm [6'-0"]. Corridor width shall comply with applicable egress codes.

2-7.12.1.1 Function: Entry to the facility; egress and circulation through the building.

2-7.12.1.2 Furnishings/Fixtures/Equipment: the following items will be Contractor furnished and installed:

wall mounted electric water cooler. Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. Provide interior signage to identify major spaces. Provide one building directory near each main entrance and one building directory near first floor elevator doors. The follwing item will be Government furnished and installed: Provide one 1219 mm high x 1829 mm wide [4'-0" x 6'-0"] wall mounted bulletin board.

2-7.12.1.3 Finishes:
Floor: vinyl composition tile
Base: resilient cove base.
Walls: painted gypsum wallboard
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.12.1.4 Other requirements: Handicap accessible.

2-7.12.2 **Vending Area (VENDING).** Provide minimum one area on the third floor..

2-7.12.2.1 Function: Space for soft drink and snack vending machines, and ice machine-dispenser.

2-7.12.2.2 Furnishings/Fixtures/Equipment: The following items will be Government furnished and installed: one ice cube machine-dispenser designed for hotel ice bucket filling, capable of producing minimum 250 lbs. of regular ice cubes in 24 hours, with 180 lb. Storage; ice machine manufacturer's automatic cleaning system to clean and sanitize the water distribution system of the machine at scheduled intervals. Ice machine shall be Energy Star compliant; four full-size soft drink and snack vending machines. Vending machines will not require plumbing connections.

2-7.12.2.3 Finishes:
Floor: vinyl composition tile
Base: resilient base
Walls: painted gypsum wallboard.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.12.2.4 Other requirements: Provide electrical power to accommodate vending machines and to comply with applicable codes.

2-7.13 **Command Section Common Locker/Shower Areas (BATTALION TOILET/SHOWER)**. Provide one group of men's and one group of women's common locker/shower area on the third floor of Building 357. Provide the quantity of lockers and fixtures as indicated in the table below. Handicapped accessibility is not required. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-7.13 Locker Room Plumbing Fixture and Locker Quantities**

| | BATTALION HQ | |
|---|---|---|
| | **MEN** | **WOMEN** |
| **Lockers** | 16 | 8 |
| **Toilets** | 3 | 3 |
| **Urinals** | 2 | - |
| **Lavatories** | 3 | 3 |
| **Unisex Showers** | 2 | |

2-7.13.1 **Women's Locker Room**. Provide one room sized to accommodate the number of lockers and plumbing fixtures described. Provide exterior entrance(s) with vestibule. For egress purposes, the

occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.13.1.1 Function: Toilets, showers and lockers for female soldiers.

2-7.13.1.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.13.1.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-7.13.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.13.2 **Men's Locker Room**. Provide one room, sized to accommodate the number of lockers and plumbing fixtures described. Provide exterior entrance(s) with airlock vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.13.2.1 Function: Toilets, showers and lockers for male soldiers.

2-7.13.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.13.2.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-7.13.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.14 **BUILDING 357 SUPPORT AREAS**. Provide the following areas for the Battalion HQ building. Handicapped accessibility is not required in mechanical rooms, electrical and communications closets, and elevator machine room. All other support spaces shall be handicap accessible.

2-7.14.1 **Mechanical Room(s) (MECH)**. Provide dedicated areas for mechanical equipment located on the third floor. Each battalion shall have independent operation and control of HVAC system for its own spaces, but mechanical equipment may serve more than one battalion, and mechanical rooms may be combined. Mechanical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Rooms shall allow easy equipment removal and maintenance. Provide floor openings and vertical shaft spaces as necessary.

2-7.14.1.1 Function: Spaces for HVAC, water heating, and other plumbing and mechanical equipment.

2-7.14.1.2 Furnishings/Fixtures/Equipment: None.

2-7.14.1.3 Finishes:
Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard and painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.1.4 Other requirements: Doors shall have storeroom function lockset master-keyed to existing system.

2-7.14.2 **Electrical Room(s) (ELEC)**. Provide dedicated areas for electrical equipment located on the third floor. Each battalion shall have independent metering and control of the electrical system for its own spaces, but electrical equipment may serve more than one battalion, and electrical rooms may be combined. Electrical rooms shall not be used for storage or other purposes. Access will be limited to authorized personnel. Rooms shall allow easy equipment removal and maintenance.

2-7.14.2.1 Function: Spaces for electrical equipment.

2-7.14.2.2 Furnishings/Fixtures/Equipment: None.

2-7.14.2.3 Finishes: Floor: sealed concrete
Base: resilient cove base
Walls: painted gypsum wallboard or painted veneer plaster, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.2.4 Other requirements: Electrical service to buildings shall be underground. Doors shall have storeroom function lockset master-keyed to existing system..

2-7.14.3 **Telecommunication Room (TELE)**. Provide dedicated room(s) for communication distribution equipment located on the third floor. Each room shall be dedicated to a single battalion, and shall not be combined with mechanical or electrical rooms. Provide each battalion with one main communication room; minimum size 3048 mm [10'-0"] x 3353 mm [11'-0"]. In two-story buildings, the communication room shall be located on the second floor. Provide additional communication rooms as needed; all spaces having telephone or computer data outlets shall be located to allow a maximum cable length of 90 m [295 feet] between outlet and communication room. Minimum dimensions of secondary communication rooms shall be 2134 mm [7;-0"] x 3048 mm [10'-0"]. Provide floor openings and vertical shaft spaces as necessary. Rooms shall be accessed

from corridors. Access will be limited to authorized personnel.

2-7.14.3.1 Function: Distribution areas for telephone, data network, and cable television.

2-7.14.3.2 Furnishings/Fixtures/Equipment: None.

2-7.14.3.3 Finishes: Floor: vinyl composition tile.
Base: resilient cove base
Walls: painted gypsum wallboard, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.3.4 Other requirements: Door shall have minimum 914 mm [3'-0"] wide door with lockset master-keyed to existing system.. Provide three 102 mm [4"] empty conduits connecting vertically stacked communication rooms.

2-7.14.4 **Elevator**. Provide one hydraulic passenger elevator.

2-7.14.4.1 Function: Vertical conveyance of people and furniture.

2-7.14.4.2 Furnishings/Fixtures/Equipment: Passenger elevator: 2,500 lb. capacity, minimum 75 feet per minute speed; center opening doors. Refer to Chapter 5 for additional requirements.

2-7.14.4.3 Cab finishes: Floor: vinyl composition tile
Walls: plastic laminate
Ceiling: suspended translucent panel
Car door and front: satin finish stainless steel
Hoistway entrance doors and frame: satin finish stainless steel

2-7.14.4.4 Other requirements: Handicapped accessible.

2-7.14.5 **Elevator Machine Room (MACH)**. Provide one on the first floor. Size to comply with equipment and code requirements.

2-7.14.5.1 Function: Space for hydraulic elevator equipment.

2-7.14.5.2 Furnishings/Fixtures/Equipment: None.

2-7.14.5.3 Finishes: Floor: sealed concrete
Base: resilient cove base
Walls: painted concrete, or painted concrete masonry units
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.6 **Interior Corridor**. Provide as required to allow circulation to building spaces, and comply with applicable code egress requirements. Due to security, climate, and force protection concerns, interior corridors are the preferred means of circulation between living units and other building spaces.

2-7.14.6.1 Function: Circulation and means of egress.

2-7.14.6.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.14.6.3 Finishes:
Floor: vinyl composition tile

Base: resilient cove base.
Walls: impact resistant gypsum wallboard with painted finish.
Ceiling: patch existing exposed ceiling to match existing adjacent and paint.

2-7.14.6.4 Other requirements: Handicap accessible.

2-7.14.7 **Exterior Corridor (LANAI).** Refers to an unconditioned, covered circulation space that is enclosed on one long side (adjacent to the building), and has a guardrail on the other side. Provide as required to allow circulation to building spaces and comply with applicable code egress requirements. exterior corridors may be provided to link breezeways with stairs and other circulation components. Exterior corridors shall not be used to provide access to living units

2-7.14.7.1 Function: Circulation and means of egress.

2-7.14.7.2 Furnishings/Fixtures/Equipment (FFE): Provide mechanical and electrical systems to comply with applicable codes. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes. All fixtures and equipment shall be suitable for exterior locations.

2-7.14.7.3 Finishes:
Floor: sealed concrete
Base: Exterior wall material
Walls: Exterior wall material
Ceiling: painted underside of concrete structure above

2-7.14.7.4 Other requirements: Handicap accessible. With the exception of fire sprinkler systems, no piping, conduit or ductwork shall be exposed in exterior corridor. Provide slip resistant finish texture on concrete floor. Guardrails shall be designed in accordance with applicable codes.

2-7.14.8 **Loft Space (LOFT)**. Occurs on the third floor of Building 357

2-7.14.8.1 Function: unfinished space

2-7.14.8.2 Furnishings/Fixtures/Equipment: N.A.

2-7.14.8.3 Finishes:
Floor: stripped smooth of existing finish
Base: none
Walls: paint existing walls
Ceiling: painted underside of concrete structure above.

2-7.14.8.4 Other requirements: Provide pair of 914 mm [3'-0"] wide historic doors as required.

**2-7.15 Common Locker/Shower Facilities Building 357 (COF TOILET/SHOWER)**. Provide one group of men's and one group of women's common locker/shower facilities for each company. Three (3) COF Toilet/Showers shall be provided , one on each floor, in Building 355. Two (2) COF Toilet/Showers shall be provided on the second floor in Building 357. The COF Toilet/Shower for the Large COF shall be located on the third floor of Building 355.. Quantities of lockers and plumbing fixtures for men and women vary by company size. Provide the quantity of lockers and fixtures for Medium Company Operations Facility on the first and second floor and as indicated in the table below. Provide the quantity of lockers and fixtures for Large Company Operations Facility on the third floor and as indicated in the table below. Soldiers will use locker rooms before and after physical training. Handicapped accessibility is not required. Additional entrances may be provided from a common public corridor in the COF. Entrances shall be separate and

distinct from the entrances to company supply and administrative areas. Exterior entrance vestibules shall be provided. Entrances shall provide visual privacy into the spaces.

**Table 2-7.15 Locker Room Plumbing Fixture and Locker Quantities**

| | MEDIUM COMPANY | |
|---|---|---|
| | **MEN** | **WOMEN** |
| **Lockers** | 82 | 8 |
| **Toilets** | 2 | 1 |
| **Urinals** | 1 | - |
| **Lavatories** | 2 | 1 |
| **Showers *** | 5 | 1 |

2-7.15.1 **Women's Locker Room**. Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.15.1.1 Function: Toilets, showers and lockers for female soldiers.

2-7.15.1.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories: one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one sanitary napkin disposal per toilet; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; two double pin robe hooks at each dressing compartment; one robe hook on each toilet partition door; one sanitary napkin and tampon vending machine. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.15.1.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-7.15.1.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

2-7.15.2 **Men's Locker Room**. Provide one or more rooms, sized to accommodate the number of lockers and plumbing fixtures required for each company served. Provide exterior entrance(s) with vestibule. For egress purposes, the occupant load shall be equal to the higher of the following numbers: a) the number of lockers in the room, or b) the code determined number of occupants calculated by multiplying room area x the occupant load factor.

2-7.15.2.1 Function: Toilets, showers and lockers for male soldiers.

2-7.15.2.2 Furnishings/Fixtures/Equipment (FFE): The following items will be Contractor furnished and installed: floor mounted toilets, wall-hung lavatories, and ceramic tile shower enclosures in the quantities indicated in the table above. Provide toilet partitions at each toilet. Provide the following toilet accessories:

one mirror with shelf above each lavatory; one paper towel dispenser/waste receptacle per two lavatories (or fraction thereof); one soap dispenser per lavatory; one toilet tissue dispenser per toilet; one toilet seat cover dispenser per toilet; one soap holder per shower; one shower curtain and rod at each shower; one double pin robe hook outside each shower; one robe hook on each toilet partition door. Provide 305 mm [1'-0"] of locker room bench per 5 lockers provided. Provide two wall mounted GFCI electric outlets per two lavatories (or fraction thereof); mount adjacent to mirrors. Provide electric water cooler (EWC) at entrance vestibule from exterior. Provide fire extinguishers in semi-recessed fire extinguisher cabinets to comply with applicable codes.

2-7.15.2.3 Finishes:
Floor: ceramic tile.
Base: ceramic tile.
Walls: ceramic tile.
Ceiling: painted water resistant gypsum board.

2-7.15.2.4 Other requirements: Provide 914 mm [3'-0"] wide entry door. Locks shall be as specified in paragraph 5-4.9.5.3.

**2-8 OTHER STRUCTURES.** Detached Structures that support the four Quad Buildings

2-8.1 **Gear Wash Building (GEAR WASH BUILDING)**. Provide one located at the courtyard of Quad C. This structure is a combination of Gear wash and recreation area. Provide covered and paved exterior structure for gear wash and picnic functions. The recreation and gear wash area will be used use by several soldiers at a time. Design similar to Quad F Gear Wash Building, see sketches in Attachment 25

2-8.1.1 Function: Exterior area for washing, TA-50 gear and footgear prior to entering building. Also, area for outdoor recreation that includes picnic table and barbeque area.

2-8.1.2 Furnishings/Fixtures/Equipment: the following items will be Contractor furnished and installed: Provide drainage assembly for gear wash area: provide continuous x 305 mm [12"] wide aluminum or stainless steel trench grating, with non-slip surface, supported by concrete trench walls. Concrete trench will terminate at a storm drainage inlet box. Box shall be filled with stone and filter material to trap sediment . Filtered runoff shall be piped to storm drainage system. Provide hosebib at 914mm [3'-0"] on center and 914mm [3'-0"] above floor grating. Provide main shut-off valve for hosebibs. Provide stainless steel gear rack for mounting on wall above trench grating; gear rack properties: 13mm [1/2"] thick x 152mm [6"] high x continuous length of trench drain. Fabricate in 1676mm [5'-6"] sections. Gear rack shall be mounted at 1676 mm [5'-6"] above trench. Top of grating and concrete structure shall align with adjacent concrete sidewalk. Provide concrete sidewalk between boot wash area and entrance sidewalk. Provide S.S. one basin wall mounted hand sink. Provide . The following items will Government furnished and installed: picnic tables and single chairs for 60 people.

2-8.1.3 Finishes: refer to exterior building material requirements.

2-8.1.4 Other requirements: Provide adequate drainage away from building.

2-8.2 **Pump House (PUMP HOUSE)**. Provide one at the corner of Waianae and Meigs Avenue.

2-8.2.1 Function: Exterior self-supporting building for fire pump equipment including, but not limited to, equipment as indicated.

2-8.2.2 Furnishings/Fixtures/Equipment: As required by Statement of Work and as indicated. Concrete floor slab shall be of sufficient strength and be designed for the equipment provided.

2-8.2.3 Finishes: refer to exterior building material requirements, see Chapter 5, paragraph 5-4.

Floor: sealed concrete; non-slip coating.
Base: none
Walls: painted concrete masonry units
Ceiling: exposed to structure, paint.

2-8.2.4 Other requirements: Provide adequate drainage away from building.

2-8.3 **Chiller Plant Building (CHILLER PLANT BUILDING)**. Provide one at the corner of Waianae and Meigs Avenue.

2-8.3.1 Function: Exterior self-supporting building for HVAC and hot water equipment including, but not limited to, equipment as indicated and in the Statement of Work

2-8.3.2 Furnishings/Fixtures/Equipment: As required by Statement of Work and as indicated. Concrete floor slab shall be of sufficient strength and be designed for the equipment provided.

2-8.3.3 Finishes: refer to exterior building material requirements, see Chapter 5, paragraph 5-4.
Floor: sealed concrete; non-slip coating.
Base: none
Walls: painted concrete masonry units
Ceiling: exposed to structure, paint.

2-8.3.4 Other requirements: Provide adequate drainage away from building.

# CHAPTER 3

## SITE PLANNING AND DESIGN

3-1 **SCOPE OF WORK.** This project consists of renovation and improvement of an existing Brigade Complex. Site planning and design shall be based on the concept design provided with the RFP drawings and the SOW requirements contained herein.

3-2 **SITE VERIFICATION.** Graphic and narrative descriptions of site opportunities and constraints have been provided. Concept design (approximately 30-35% level) Demolition, Site and Utility and Grading Plans are included with the RFP drawings. Water and electrical utility base maps are also included for informational purposes. Each offeror shall verify that the site meets the program requirements. The offeror shall perform a detailed site analysis to verify that the site meets the Brigade Complex requirements that are provided. The analysis results shall be documented in a written and graphic summary of site opportunities and constraints.

3-3 **EXISTING CONDITIONS.** The offeror shall be provided with a digital topographic survey for this site by the Contracting Office. It is the offeror's responsibility to verify the Government-furnished survey and obtain all additional survey information that may be required for a completed design and construction project. Any discrepancies which are found in the Government furnished survey shall be brought to the immediate attention of the Contracting Officer for clarification.
Schofield Barracks Brigade Complex, Quad C is bound by Waianae Avenue and Foote Avenue to the north and south, and Meigs Avenue and Flagler Avenue to the east and west. The complex encompasses approximately 4 hectare, in which Buildings 355, 356, 357 and 358 are situated. Existing uses within the complex include billeting, storage, administrative operations, and dining facilities for military personnel. An access road and parking are currently provided within the Quad as well as at the perimeter. A large open courtyard and basketball courts lie within the center of the Quad.

Potable water, wastewater, fire protection and a drainage system provide support to the on-site facilities. However, preliminary analyses of the supporting infrastructure indicate that the existing utilities are deteriorating and inadequate in providing sufficient service to the complex.

3-3.1 BaseMaps. Maps of the existing water and electrical distribution systems are included in the RFP drawings.. The locations of existing utilities shown on the utility maps are approximate only. The offeror shall scan the construction site with electromagnetic or sonic equipment and mark the surface of the ground where existing underground utilities are discovered. Immediately contact the Contracting Officer if actual conditions vary from the topographic survey.

3-4 **EXCAVATION PERMITS.** The contractor shall obtain approved U.S. Army Garrison, Hawaii Excavation Permit prior to beginning excavation work. A copy of the USAGH Excavation Permit is attached.

3-5 **SITE DEVELOPMENT PLAN.** Site improvements for the Quad C renovation should include:

- Provide grading for disturbed areas as a result of demolition work. Grade for parking lot extension east of Building 358. Additional parking provided shall replace those stalls lost as a result of AT/FP standoff requirements. Review existing site grading and correct any existing drainage deficiencies that may occur.
- Install new concrete curbs/ gutters within Quad C project limits.
- Install new concrete walkways within Quad C project limits.
- Install new AC pavement at interior access road within the Quad. Pavement analysis shall be conducted to verify pavement design.
- Extend parking lot east of Building 358 to provide for additional parking stalls removed for AT/FP requirements. Restripe the existing parking lot, as required to provide the required standoff distance.

- Install "No Parking" signage along Foote Avenue, Flagler Road, and Waianae Avenue.
- Parking with controlled access will be provided within Quad C for organizational vehicles only. Provide new pavement striping, as required.
- Cold-plane and provide 32 mm AC pavement overlay and acrylic surface at existing basketball courts. Provide restriping for two basketball courts and two volleyball courts.
- Install new posts and goals for each basketball court. Provisions for volleyball courts shall also be made.
- Install traffic gate (key card) for AT/FP access and exit control within Quad C. Access locations should be located along Waianae Avenue and intersection of Foote Avenue and Flaggler Road. Exit locations should be provided at Foote Avenue and intersection of Waianae Avenue and Flaggler Road.
- Install traffic gate (key card) and curbed landscape planters for AT/FP access control to parking lot east of Building 358.
- Install pipe bollards adjacent to new elevator shaft at Building 355.
- Provide two new bike racks (13 each, minimum) with concrete slabs adjacent to Buildings 355 and 356.
- Locate covered gear wash adjacent to basketball courts. Effluent shall be discharged into the sewer system.
- Locate chiller plant and fire pump house at area east of Building 355.
- Locate trash container enclosure at parking lot east of Building 358. Trash enclosure should be located outside the 25 meter standoff area.

3-6 **GRADING AND DRAINAGE.** Site grading and drainage shall be based on the concept design provided and the requirements contained in Site Engineering Chapter 4. The drainage scheme shall consist of all surface runoff directed to existing curb inlets adjacent to the project site. In addition, the grading should provide grading for areas disturbed during demolition and construction.
The principles of positive drainage should be applied to control the conditions that remove rainfall away from facilities and functions. Federal, State and local regulations regarding the design of stormwater management systems shall be considered the minimum design criteria. An NPDES permit shall be obtained as necessary. Additionally, minimize the impact of construction activities on drainage and prevent loss of soils by water and wind erosion. Designs which improve on existing water quality by incorporating sustainable design principles are encouraged, consistent with budget constraints and activity requirements.

3-7 **GENERAL SITE DESIGN CRITERIA.** Site design criteria shall be based on the concept design provided or as approved. The concept design established the following: orientation, site organization, spatial balance, character and scale, compatibility, life safety, circulation systems, view of the site, buffer zones, wind control, vehicular and pedestrian access, parking spaces for residents, administrative staff, handicapped, and visitors, connecting walks, fire protection access, site lighting, site furnishings, mechanical enclosures, trash collection dumpsters with trash enclosures, landscaping, and etc. Perimeters are restricted by antiterrorism/force protection minimum stand off distances.

3-8 **CIRCULATION AND PARKING.** The vehicular and pedestrian circulation system shall be based on the concept design provided or as approved. Quad C can be accessed from Waianae Avenue, Foote Avenue and Flagler Avenue by both vehicles and pedestrians. An access road, which shall be replaced, is provided within the Quad, which provides vehicular circulation for military personnel within the complex. Existing pipe posts and chains provide controlled access into the Quad, however, they are old and need to be replaced. Concrete walkways provide for pedestrian circulation through the site. Due to the condition of

the existing walkways, curbs and gutters, which are mildew stained, broken and uneven (tripping hazard), all walkways, curbs and gutters within the Quad should be replaced.
Additional parking stalls will be provided, to replace stalls removed for AT/FP requirements, by extending the parking east of building 358. Parking with controlled access, keyed gates and barriers for AF/TP access control, will be provided, within Quad C, for organizational vehicles only and for the POV parking lots west of building 356 and east of building 358. The circulation and parking system shall promote safe, efficient movement of vehicles and pedestrians within the site area. The vehicular and pedestrian circulation system should maintain the maximum separation of vehicles and pedestrians. Safe circulation systems have a clear hierarchy of movement, lead to a clear destination, and do not interrupt other functions. The following criteria shall be considered for designing parking and drives for vehicles and pedestrians:

3-8.1 Vehicular Circulation. Vehicular circulation layout is determined by applying the design vehicle templates to the site design. The passenger car class includes passenger cars and light delivery trucks, such as vans and pick-ups. The passenger car template is equivalent to the non-organizational - privately owned vehicle (POV). The truck class template includes single-unit trucks, recreation vehicles, buses, truck tractor semi-trailer combinations, and trucks or truck tractors with semi-trailers in combination with full trailers. Templates showing the turning movements for design vehicles are provided by the American Association of State Highway and Transportation Officials (AASHTO). Obtain templates and utilize them during the design of the facility. Provide the vehicle clearances that are required to meet traffic safety for emergency vehicles, service vehicles, and moving vans. Site entrances and site drive aisles shall include required traffic control signage. Maximize spacing between drives, incorporate right-angle turns, and limit the points of conflicts between traffic. Roadways shall be striped and marked with with thermoplastic compounds.

3-8.2 Parking and Access Driveway Design. Design all pavements for the wheel load associated with the design vehicle. Driveways shall be designed for two-way traffic and with a 3.1 m[10 ft.] minimum lane width. Minimum pavement edge radius for driveway intersection with installation roads shall be 4.6 m [15 ft.] and 9 m [30 ft.] respectfully.

3-8.3 Parking Area Layout Design.

3-8.3.1 Administrative Parking Area. Provide 44 parking stalls for area west of building 356 and 148 stalls for the area east of building 358. POV stalls without vehicle overhang shall be a 2.7 m x 5.5 m [9 ft x 18 ft]. The design vehicle template that is used to design this space shall be described. Parking aisle width shall be minimum 7.5m (24 ft.). Island widths shall be minimum 3 m (9 ft). Parking stall fillets shall be minimum 1 m (3 ft).

3-8.3.2 Handicap Accessible Vehicle (HAV) Parking. Parking space width, length, pavement marking, signage and accessible route clearances shall be provided as required to meet current Federal Accessibility Standards (FAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG)..

3-8.3.3 Wheel Stops. Vehicle wheel stops shall be provided. Wheel stops shall be positioned to prevent vehicle overhang from encroaching and damaging adjacent objects (sign post, planter box, etc.) located immediately in front of the stall.

3-8.3.3 Pavement Marking. Parking stall markings for other than handicap accessible stalls shall be painted with white 4-inch wide stripes. Arrows shall be marked with thermoplastic compounds. Parking spaces shall be marked reserved for military staff, organizational, employee, visitor, etc. After award, Contractor shall coordinate with the Government for exact number of reserved stalls and labeling requirements. Stop or approved bar stripes shall be provided at intersections at stop conditions with white thermoplastic striping.

3-8.4 Pedestrian Circulation. Pedestrian paths shall be provided from the parking areas to the building and from the existing roadway to the building. Pedestrian circulation should be safe and separate from vehicle circulation. Provide good sidewalk layout to connect all building entrances with parking and site facilities and existing walks. Pedestrian circulation should be based on pedestrian desired lines of walking between site

facilities and existing walks. Desired lines should be weighted to predict the most traveled routes. These routes would require paving. Topography and vegetation can be used to reinforce a sense of movement. Design pedestrian concentration areas with adequate paved area.

3-8.4.1 Sidewalk Design**.** Sidewalk design shall be based on the concept design provided. Walks widths shall be as indicated on the concept design drawings. Sidewalks shall be constructed with wire mesh reinforced concrete with a minimum thickness of 100 mm [4 in] and 1.25m(4 ft.) wide.

3-8.4.2 Ramps. Where required, ramps for the handicapped shall meet Federal Accessibility Standards (FAS) and Americans with Disabilities Act Accessibility Guidelines (ADAAG).

3-8.5 Trash and Electrical Equipment Enclosure Design.

3-8.5.1 General. Approximate size and layout of Trash and Electrical enclosures are indicated on the attached RFP civil concept drawings. Mechanical enclosure is attached to the southeast corner of the building and is indicated on the Architectural RFP Drawings. Contractor shall ensure final layout design will satisfy operational and maintenance requirements.

3-8.5.2 Trash Enclosure. Trash enclosure size and layout shall be compatible with the type of trash bin and collection service requirements. Design-Build Contractor shall coordinate with the DPW contracting office, 808-969-2496, for operational requirements. Enclosure wall height shall be sufficient to screen views from adjacent buildings and public roadways. Walls shall be constructed of split face CMU and shall be compatible with the architectural theme of the proposed new facility. In addition, trash enclosures shall be provided with a wheel stop along base of the far/inside wall of the enclosure to function as a barrier to protect the enclosure wall from accidental impacts.

3-8.5.3 Electrical Equipment Enclosure. Size of enclosure shall be in compliance with applicable codes and equipment manufacturer requirements. For applicable codes sheet Chapter 4, Site Engineering, Para. Section, Electrical Distribution.

3-9 **ANTITERRORISM/FORCE PROTECTION (AT/FP) STANDOFF REQUIREMENTS.**

3-9.1. General. The facilities shall be designed to meet DOD AT/FP requirements. (Note: For AT/FP Structural Requirements, see Chapter 6, Structural Design.)

3-9.2. Project Specific Requirements. Site Force Protection Standards that apply to the Quad C renovation project are as follows (Refer to structural engineering design analysis as it pertains to standoff requirements):

- Facility Characteristics (Unobstructed Space): Ensure that obstructions within 10 meters of inhabited buildings or portions thereof do not allow for concealment from observation of explosive devices 150 mm or greater in height.
- Establish access control to portions of parking areas that are closer than the required standoff distance to ensure unauthorized vehicles are not allowed closer than the required standoff distance. For primary gathering buildings and billeting, if access control is provided within the standoff distance, controlled parking may be permitted as close as 10 meters without hardening or analysis.
- Eliminate parking on roadways within the required standoff distances along roads adjacent to existing buildings.

For trash containers the minimum standoff distances apply:

- Inhabited Buildings – 10 meters
- Where the standoff distance is not available, harden trash enclosures to mitigate the direct blast effects and secondary fragment effects of the explosive on the building if the applicable level of protection can be proven by analysis. If trash enclosures are secured to preclude introduction of objects into the enclosures by unauthorized personnel, they may be located closer to the building

as long as the provisions for “unobstructed space” are not violated.

- Openings in screening materials and gaps between the ground and screens or walls making up an enclosure must not be greater than 150 mm.

# CHAPTER 4

## SITE ENGINEERING

4-1 **REFERENCE REQUIREMENTS AND STANDARDS**. (Note: Where a conflict between requirements and/or standards occur, the more stringent shall apply.)

4-1.1. **Army/Military Construction Criteria**. Unless otherwise noted, the following criteria is available via the internet at;

http://www.hnd.usace.army.mil/techinfo/engpubs.htm

4-1.1.1. U.S. Army Corps of Engineers Technical Instructions, TI 800-01, Design Criteria, 20 July 1998.

4-1.1.2. U.S. Army Corps of Engineers Technical Instructions, TI 804-21, Design for Non-Organizational or Privately Owned Vehicle (POV), Site Circulation and Parking, November 1998.

4-1.1.3. Engineers Technical U.S. Army Corps of Instructions, TI 814-20, Wastewater Collection, 3 August 1998

**4-1.1.4. Army Technical Manual, TM 5-813-5, Water Supply, Water Distribution, November 1986**

**4-1.1.5.** United Facilities Criteria, UFC 3-600-01, Design: Fire Protection Engineering for Facilities, 17 April 2003.

4-1.1.6 Interim Department of Defense Antiterrorism/Force Protection Construction Standards, December 16, 1999. (For Official Use Only, not available for viewing or download. After award of the Contract, a copy will be provided to the Contractor.)

4-1.1.7 Unified Facilities Guide Specifications (UFGS). The web site address i
http://www.hnd.usace.army.mil/techinfo/gspec.htm

4-1.1.8 US Army Corps of Engineers Technical Instructions, TI 810-32, Heating and Cooling Distribution Systems, 10 January 2003.

4-1.1.9 UFC 4-010-01, DoD Minimum Antiterrrorism standards for Buildings, 31 July 2002.

4-1.2. City and County of Honolulu Design Standards. The following references are available for purchase from the City and County of Honolulu Municipal Book Store, 558 South King Street, City Hall Annex, Honolulu, HI 96813, Phone: (808) 523-4780. Information on how to purchase and order publications is available via the internet at;

http://www.co.honolulu.hi.us/pur/booklist.htm

4-1.2.1. Rules Relating to Storm Drainage Standards, Department of Planning and Permitting, City & County of Honolulu, January 2000.

4-1.2.2. The Department of Public Works, Standard Specifications for Public Works Construction, City and County of Honolulu, Sept. 1986.

4-1.2.3. The Department of Public Works, Standard Details for Public Works Construction, City and County of Honolulu, Sept 1984.

4-1.2.4. Board of Water Supply, Water System Standard and Approved Material List and Standard Details for

Water System Construction, Volume 1 and 2, City and County of Honolulu, 2002.

4-1.3 American Association of State Highway and Transportation Officials (ASSHTO) Publications. Standards are available online at www.transportation.org

4-1.3.1 U.S. Department of Transportation, Federal Highways Administration, Manual On Uniform Traffic Control Devices, Millennium Edition

4-1.3.2 AASHTO LRFD Bridge Design Specifications, 2nd Edition, 1998.

4-1.3.3 ASSHTO A Policy on Geometric Design of Highways and Streets, 4th Edition - The Green Book, 2001.

4-1.3.4 ASSHTO Roadside Design Guide, 2002.

4-1.3.5 UFC 4-010-01

4-1.4. Americans with Disabilities Act Accessibility Guidelines (ADAAG). Available from U.S. Architectural and Transportation Barriers Compliance Board, Suite 1000, 1331 F Street, N.W., Washington, D.C. 20004-2111 (202) 272-5434 or through the internet (http://www.access-board.gov/indexes/accessindex.htm).

4-1.5. American Water Works Association, Inc. (AWWA). Specifications are available from AWWA, 6666 Quincy Ave., Denver, CO 80235; voice: 800-926-7337; fax: 303-795-1989: http://www.awwa.org/. AWWA standards called for the standards of the Board of Water Supply, City and County of Honolulu, the following apply: AWWA C907 PolyVinyl Chloride (PVC) Pressure Fittings for Water - 4 Inch Through 8 Inch (100 mm Through 200 mm).

4-1.6 Storm Drainage Standards, Department of Public Works, County of Hawaii, February 1970. Information: Phone: 961-8321, Address: Hawaii County Building, 25 Aupuni Street, Room 202, Hilo, HI 96720.

## 4-2 SOILS, PAVEMENTS AND EARTHWORK

Soils Investigation Report (Geotechnical Report). Preliminary Soils Investigation Report dated March 2003 for Quad C is furnished in attachment entitled Preliminary Soils Investigation Report. Based upon the data provided in the RFP and Preliminary Soils Investigation Letter Report, a comprehensive Final Soils Investigation Report shall be furnished by the Offeror to whom this contract is awarded. The Final Soils Investigation Report shall be prepared by a professional engineer registered in the State of Hawaii with more than 10 years of experience in soil mechanics and geotechnical engineering. The Final Soils Investigation Report shall certify to the adequacy of the soil and foundation aspects of the design, including, but not limited to, special foundation types, earthwork construction, surface and subsurface drainage, erosion and siltation prevention during and after construction, and settlement or heave. After Government review of the Final Soils Investigation Report, additional soil borings, testing, and investigation, if required, shall be furnished by the Offeror with the final design documents at no additional cost to the Government.

NOTE TO OFFEROR: The soils investigation report furnished by the Government is a Preliminary Report intended for basic information only. The approximate subsurface soil conditions may not represent conditions at all locations. The flexible pavement sections and overlays shall be as designed for actual traffic and soil conditions, but in no case shall they be lighter (thinner) than that indicated below and in the Preliminary Soils Investigation Letter Report. Should new traffic parameters or actual soil conditions require a heavier pavement structure, a thicker pavement section shall be furnished by the Offeror.

### 4-2.1. **Minimum Pavement Structures:**

Parking Lots: 50 mm (2”) Asphaltic Concrete, State DOT IV Mix, 150 mm (6”) Base Course, 125 mm (5”) Subbase Course

Subbase and Base Course Compaction: Subbase and base course shall be compacted to minimum 100% of maximum density in accordance with AASHTO T 180.

4-2.2. **Soil Compaction**.

4-2.2.1. Soil compaction shall be per local standards specified for use in this contract and as amended herein. Compact each layer to not less than the percentage of maximum density specified in Table 4.1, determined in accordance with ASTM D 1557 Method D:

**TABLE 4.1- SOIL COMPACTION**

| Subgrade Preparation, Fills, Embankments, and Backfills | Compaction Requirements (Percentage of Maximum Density) | |
|---|---|---|
| Structures & Building Slabs | Cohesive Material<br>90 | Cohesionless Materials<br>95 |
| Streets, Paved Areas, Bike Paths | 90 | 95 |
| Sidewalks and Grassed Areas | 85 | 90 |

4-2.2.2. The compaction requirements shall be verified or modifications shall be recommended by the soils engineer in the Final Soils Report wherever engineering, soils, or climatic factors indicate the necessity to do so. Any modification to the stated compaction requirements shall require the approval of the Contracting Officer.

4-2.2.3. Soil Classification.

4-2.2.3.1. Cohesionless materials include materials classified in ASTM D 2487 as GW, GP, SW and SP. Cohesive materials include materials classified as GC, SC, ML, CL, and MH. Materials classified as GM and SM shall be identified as cohesionless only when the fines are nonplastic.

4-2.2.3.2. Satisfactory materials for filling and backfilling under all structures and general earthwork shall comprise any excavated on-site materials or imported materials classified in accordance with ASTM D 2487 as GW, GM, GC, GP, SW, SP, SM, SC, ML, MH, and CL, free of organic matter, stones larger than 75 mm (3-inches) in any dimension, other deleterious materials, and expansive values less than or equal to 2% when tested by the California Bearing Ratio method. For imported materials, that portion passing the No. 40 sieve shall be either nonplastic or shall have a liquid limit not greater than 40 and a plasticity index not greater than 15. Liquid limit and plasticity index shall be determined by ASTM D 4318. Where satisfactory materials are not available in sufficient quantity from required excavations, borrow materials shall be obtained from approved sources off Government-control land at the Contractor’s responsibility.

4-2.3. **Concrete Slab-On-Grade.**

4-2.3.1. Granular Termite Barrier (GTB), see sketches in attachment section for typical sections: A 100 mm (4-inch) minimum thickness granular termite barrier shall be installed under the concrete slab of the building. The GTB shall be placed under the vapor barrier and over the capillary water barrier (CWB) with a separation geotextile installed between the GTB and the CWB.

4-2.3.1.1. Exterior Perimeter Footings: When “stayform” is used to retain a vertical face along the inside of exterior footings, the bottom of the stayform shall be elevated 50 mm (2 inches) above the bottom of the footing to allow GTB material to migrate beneath the bottom of the stayform and separate the stayform and the subgrade. Along the outside edge of the footing, a minimum 100 mm (4-inch) wide, vertical GTB-filled-trench shall be provided. A root control fabric impregnated with plastic nodules containing trifluralin, Bio-barrier Root Control, or equal, shall be installed along the vertical interface between the GTB and the adjacent soil. The root control fabric shall provide continuous and effective root control for 15 years or longer. A cast-in-place concrete strip, 300 mm (12-inch) wide by 75 mm (3-inch) thick, with 5% transverse slope, shall be provided at the ground surface to cap the GTB strip. The concrete strip shall be reinforced with 6/6 X W2.0 X W2.0 WWF. Contraction joints shall be provided at maximum 4’-0” spacing.

4-2.3.1.2. The natural angle of repose of the GTB material is about 10H:3V when dry and 10H:3.75V when wet. Accordingly, GTB on sloping surfaces shall be placed at slopes no steeper than 3H:1V. This will require that the sloping faces of thickened-edge footings, including the under-side concrete fillet at edges of floor slabs, be designed with a batter no steeper than 3H:1V.

4-2.3.1.3. GTB Material Gradation.

| Sieve Size | Percent Passing |
|---|---|
| (4.75 mm) No. 4 | 100 |
| (2.36 mm) No. 8 | 95 - 100 |
| (2.00 mm) No. 10 | 75 - 95 |
| (1.70 mm) No. 12 | 35 - 50 |
| (1.18 mm) No. 16 | 0 - 10 |

4-2.3.1.4. GTB Material Requirements

| | |
|---|---|
| Rock Type: | Basalt |
| Specific Gravity (ASTM C 128): | 2.70 to 2.80 |
| SiO2 (ASTM C 289): | 45% Minimum |
| L.A. Abrasion, % loss, 500 Revolutions (ASTM C 131): | 20% Maximum |
| Moh Hardness Scale: | 5 to 6 |

4-2.3.1.5. GTB material installed shall be clean and free of debris, dirt or other non-GTB material/substances that would compromise the GTB effectiveness. When GTB is installed in layers, the surface of the layer receiving additional GTB material shall be clean. Previously installed material if not clean shall be removed and replaced prior to installing additional GTB material.

4-2.3.1.6. Penetrations through the GTB other than that necessary for utility pipes/conduits shall not be made unless approved. Pipes laid in GTB material shall not be encased in sleeves or wraps that may provide a hidden path for termites. All utility pipes beneath the floor slab shall be encapsulated in minimum 100 mm (4 inches) of GTB material.

4-2.3.1.7. GTB material shall be compacted using approved equipment and methods.

4-2.3.1.8. No structure or appurtenance that is not protected by GTB material shall be allowed to be in direct contact with the dwelling unit itself

4-2.3.1.9. The Contractor's Design Proposal shall include typical GTB installation details beneath the slab and at pipe penetrations.

4-2.3.1.10. The Contractor shall submit a CQC plan to limit GTB material displacement before and during concrete placement. This is to maintain GTB material integrity and thickness for protection against termite infestation, and to maintain structural integrity of slabs and foundations.

4-2.3.2. Capillary Water Barrier and Vapor Barrier. Except as indicated herein below, capillary water barrier and vapor barrier shall be placed beneath the concrete slab on grade. The capillary water barrier shall be 100 mm (4 inches) thick. The capillary water barrier material shall be a clean, crushed non-porous rock, crushed gravel or uncrushed gravel as approved. The maximum particle size shall be 40 mm (1-1/2 inches) and no more than 2 percent shall pass the 4.75 mm (No. 4) sieve. The capillary water barrier shall be compacted with a minimum of four (4) passes of a hand-operated, plate-type vibratory compactor. A vapor barrier shall be placed directly below the concrete slab and the GTB shall be installed under the vapor barrier but over a separation geotextile which is installed over the CWB layer.

The vapor barrier shall have the following properties:

Minimum 15-mil thick polyolefin geomembrane manufactured with ISO certified virgin resins.

| | | |
|---|---|---|
| Water Vapor Transmission Rate | ASTM E-96 | not exceeding 0.006 gr./ft2/hr. |
| Permeance Rating | ASTM E-96 | not exceeding 0.015 gr./ft2/hr. |
| Water Vapor Retarder | ASTM E-1745 | meets or exceeds Class B |
| Puncture Resistance | ASTM E-1709 | minimum 1970 grams |
| Tensile Strength | ASTM D-638 | minimum 45 lbf/in. |

Properties shall be verified by independent laboratory testing and result submitted for review. Installation of the vapor barrier shall be per manufacturer's instructions with the following as the minimum; joints shall be lapped a minimum of 300 mm (12 inches) and sealed with the manufacturer's recommended mastic or pressure sensitive tape. The vapor barrier shall be lapped over footings or sealed to foundations and walls. The contractor shall check the vapor barrier surface, seams and penetrations at columns and utilities for damage and discontinuities prior to the concrete slab placement. The check shall be performed in the presence of the Contracting Officers Representative.

Standing water on the vapor barrier shall be removed prior to the concrete slab placement. The GTB shall be dampened, free of drainable water, and compacted the day before vapor barrier placement. The general contractor shall protect all exposed GTB surfaces from ponding of water or rainwater by sealing any entry points in uncompleted slabs or in unroofed buildings.

The separation geotextile shall have the minimum requirements for Class 2 as specified in AASHTO M 288-96 for geotextile survivability requirements. AOS requirements shall be compatible with the GTB and CWB gradation to provide an effective separation.

4-2.4. Earthwork for Building and Utility Systems shall be designed and constructed in accordance with industry standards unless otherwise specified herein or as approved.

4-2.4.1. **Satisfactory Materials**. Imported satisfactory materials shall be free from stones larger than 75 mm (3-inches) in any dimension.

4-2.4.2. Excavation Permits. Prior to start of excavation work, the Contractor shall obtain excavation permits from DPW & Verizon. A copy of the permit is included in Attachment, USAGH Excavation Permit. Contractor shall complete the DPW "Excavation Clearance Requirements" and submit the completed form to the Contracting Officer and DPW in order to obtain the following:

a. "DPW Excavation Permit" for Water, Sewer, Storm Drainage, Electrical, Gas, Fuel lines, etc.

b. Excavation Permit for telephone lines (communications) from Verizon and DPW.

Contractor shall carry both permits at all times during excavation.

4-2.4.3. Disposal. Excavated material not required or not satisfactory for backfill shall be removed from the site and disposed of off base.

4-3 **EROSION AND SEDIMENT CONTROL.** Erosion and Sediment Control Facilities shall be required in accordance with EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent.

4-4 **DEMOLITION.** Existing facilities scheduled for demolition shall be as indicated on the attached concept design drawings. Materials not owned by the Government and not used in construction shall be disposed of off government property. Obtain required demolition permits and disposal permits as required from City and County of Honolulu and Hawaii State Department of Health.. Obtain approval of the disposal site from the contracting officer and submit haul tickets for material disposed of off of Government property.

4.4.1 Existing utilities within the project limits shall be adjusted, relocated or modified as required to remain functional. The Contractor shall coordinate all utility adjustment work with the appropriate utility agencies/departments. The area within the project limits, which does not involve new construction, shall be graded smooth to drain, and planted with grass. All existing walks, parking and streets, drainage and utility systems at the interface with the demolition shall be properly coordinated and new construction provided for the continued functionality, operation and maintenance of adjoining and remaining facilities and systems. All existing utility structure and related appurtenances, which will not be utilized in the project shall be removed and disposed of. Abandonment in-place shall not be permitted unless approved by the Contracting Officer.

4-5 **CLEARING AND GRUBBING.** Clear and grub all trees and vegetation necessary for construction; but, save as many trees as possible.

4-6 **WETLANDS.** Jurisdictional tidal and non-tidal wetlands have not been identified on the project site. Determination has been made that jurisdictional wetlands are not on the site.

4-7 **EARTHWORK.** According to "The Soil Survey of Oahu, State of Hawaii" by the United States Department of Agriculture Soil Conservation Service in cooperation with the University of Hawaii dated August 1972, the typical soil type consists of *Kunia Series*. This series consists of well-drained soils on upland terraces and fans, which developed in old alluvium. They are nearly level to moderately sloping, where elevations range from 200 to 300 meters. The mean annual rainfall amounts to 760 to 1,015 mm, most of which occurs from November to April. The mean annual soil temperature is 228 C.

The general soil type within Schofield Barracks is identified as *Kunia Silty Clay (KyA)*. In a representative profile the surface layer is dark reddish-brown silty clay about 560 mm thick. The subsoil, 1,015 to 1,800 mm thick, is dark reddish-brown silty clay and silty clay loam that has a subangular blocky structure. The substratum is dark reddish-brown gravelly silty clay. The surface layer is medium acid to extremely acid, and the subsoil is slightly acid to strongly acid.

Permeability is moderate, while runoff is slow and the erosion hazard is no more than average.

4-7.1 **Earthwork for Building and Utility Systems** shall be design and constructed in accordance with UFGS Section 02315, Excavation, Filling and Backfilling for Buildings and Section 02316, Excavation, Trenching, and Backfilling for Utility Systems, unless otherwise specified herein or as approved.

4-8 **BORROW MATERIAL.** Obtain borrow material required for construction from sources off government property.

4-9 **WATER DISTRIBUTION SYSTEM.** The water distribution system shall be designed in accordance with Army standards contained in TM 5-813-5, Water Supply Distribution Systems and Military Handbook Fire Protection for Facilities Engineering, Design and Construction, (Mil Hdbk 1008c); and as indicated herein or approved. Construction materials, execution and testing shall be in accordance with UFGS Section 02510A, Water Distribution System; and as specified herein or approved. Where the requirements of the Army standards and the requirements defined herein disagree, the more stringent shall apply. The contractor shall determine the domestic and the fire demands for the facilities and shall verify the design of all components of the domestic and fire protection supply systems. Design of a water distribution system requires both domestic and fire flow demands be considered concurrently.

4-9.1 **Analysis of Existing System Capacity.** The existing water system consists of a series of 150 mm and 100 mm water lines as well as 75 mm laterals. A 150 mm water main taps into a 450 mm main along Waianae Avenue and a 200 mm main along Foote Avenue. 100 mm potable lines branch off the 150 mm main at the center of the courtyard and tie into the building service laterals. Two 75 mm service laterals are provided and tie into the building locations. Two existing fire hydrants located at the southwest and northeast corners of the courtyard provide fire protection to the Quad. Preliminary analysis results indicate that existing 450 mm water main along Waianae Avenue cross-connected with the 200 mm line along Foote Avenue has sufficient capacity to meet the required domestic and hydrant fir flow for the project. However, upgrades to the on-site water system will be required to provide adequate flows and pressures to the facilities. The existing 150 mm water lines in the Quad are inadequate to supply the required fire flow and pressure to the existing facilities (with clear wells turned off). Proposed water system improvements should include the following:
300 mm connection and backflow preventers at the 200 mm waterline on Foote Avenue and 450 mm waterline on Waianae Avenue; provide a 200 mm waterline for a looped system within the courtyard; building potable service laterals and fire hydrants should be connected to the new 200 mm looped water main; water lateral connection to the new chiller plant; water lateral connections to the new covered gear wash facility; replace existing 75 mm potable service laterals servicing the buildings with 100 mm laterals; install fire hydrants within Quad C courtyard at the northeast and southwest corners; provide service connection and backflow preventer to the fire pump house; provide a 200 mm looped system from the pump house to the service fire sprinkler system; provide 2 post indicator valves along the looped system for isolation; provide one 150 mm fire sprinkler line at each building and a post indicator valve at each fire sprinkler connection.

4-9.2 **Connections to Water Mains and Building Service Lines**. Connection points shall be as indicated in the concept design site and utility plan. The contractor shall be responsible for the design of the sizes, and means of connections to the existing system based on Facility requirements and system conditions.

4-9.2.1 Connections to Water Mains. Design the connections to the installation water system including the meter assemblies and the necessary backflow-preventing devices. Fire protection system shall be considered as that part of the distribution system supplying fire hydrants, or fire hydrant laterals. Service connections supply water from the main to the building. Mains shall be looped with no dead ends and be of adequate size to satisfy both domestic and fire flow requirements. Minimum main size is 200 mm [8 in]. Sufficient sectional control valves shall be provided so that no more than two fire hydrants will be out of service in the event of a single break in a water main. A copper tracer wire shall be placed directly above all non-metallic mains when plastic marking tape does not provide means of determining alignment of pipe by metal detecting equipment.

4-9.2.2 Building Connections.

4-9.2.2.1 Service lines shall be engineered with building interior plumbing to insure that wide fluctuations in

pressure, water flow, and temperature do not occur. Meter head losses shall be included in design analyses hydraulic calculations for domestic services.

4-9.2.2.2 Building connection shall have an exterior shut off valve with valve box installed underground.

4-9.2.2.3 Service lines less than 80 mm (3 inches) shall be copper pipe and fittings, Type "K" or polyvinyl chloride (PVC). Piping 80 mm (3 inches) and larger shall be ductile or PVC unless other wised approved. PVC piping less than 100 mm (4 inch) diameter shall be schedule 80 with screw joint.

4-9.2.2.3 Backflow Prevention Device. Provide reduce pressure principle backflow prevention device for each building connection in accordance with C&C of Honolulu Standards BWS

4-9.3 **Trenches**. Water line trenches shall be of a depth to provide a minimum cover of 1 m (3 ft.) in areas subject to vehicular traffic and 0.70 m (2.5 ft.) in all other areas from the existing ground surface, or from the indicated finish grade, which ever is lower, to the top of pipe. Sufficient cover must also be provided to protect the pipe against structural damage due to superimposed surface loads. Lines installed with less cover than the minimums stated shall be concrete encased with a minimum concrete thickness of 150 mm [6 in].

4-9.4 **Fire hydrants**. Two fire hydrants shall provide as indicated on the Concept Design Drawings. Fire hydrants shall be compatible with those presently in use at the installation, with similar pump and hose connections. The maximum amount of flow that can be permitted shall be determined. Fire hydrant spacing shall be no greater that 150 m [500 ft] apart by paved road. In addition, a hydrant shall be provided so that all parts of the facilities can be reached by hose lines not over 105 m [350 ft] long. All distances shall be calculated along the closest route that the fire apparatus must travel (i.e.; along the curb or access lane). Each hydrant may account for a maximum of 95 liters per second [1500 gpm] of fire protection regardless of existing pressures or water line capacity. A fire hydrant shall be located within 15m [50 ft] from any fire department connection provided. Hydrant laterals shall be 150 mm [6 in] minimum size, and shall not exceed 15 m [50 ft] in length, and shall have an underground shutoff valve. Valve box, at each lateral, shall be located within 3 m [10 ft] of the hydrant, and shall not be located where obstructed by parked vehicles, shrubbery, etc. Guard post barriers shall be provided where hydrant locations are subject to vehicle damage.

4-9.4.1 Type and Nozzles. Fire hydrants shall be wet-barrel with one 4-1/2 inch and two 2-1/2 inch outlets, with the center of hose outlets a minimum of 0.45 m (18 inches) above finish grade. Each hydrant shall be furnished with a quick-coupler type adapter for the 115-mm (4.5-inch) outlet. Each hydrant supply shall be provided with minimum 6" connection through shutoff valve and isolation valve box.

4-9.4.2 Hydrant locations along streets shall be identified with approved raised blue pavement reflector markers offset 100 mm (4 inches) towards the hydrant from the road center

4-9.4.3 Hydrant Color. Exact color to be coordinated with the Contracting Officer.

4-9.4.4 Pipe Guards. Hydrants located adjacent to parking and roads shall be protected with 100 mm [4-inch] diameter x 1.2 m [4 feet] high concrete filled pipe guards. Pipe guard materials and installation requirements shall be in accordance with Department of Water Supply, Approved Material List and Standard Details for Water System Construction, Standard Detail 33.

4-9.5 **Shutoff Valve**. Each building shall be provided with a separate service and main shutoff valve, readily accessible to maintenance and emergency personnel. Shutoff valves in walks are prohibited.

4-9.6 **Metering.** Meters shall be provided to allow the monitoring of water consumption . Meters shall be remote sensing ready adequately sized to meet the building water flow and pressure demand. Maximum velocity shall be 10 feet per second. Meters shall be located in accessible areas out of the way of vehicular traffic. Special requirements are as follows.

4-9.6.1 Meter shall be of one manufacturer and of the same model for a given size. Meter shall be of the

displacement or vertical turbine type conforming to AWWA C701 Class II unless otherwise specified or approved. Meters shall be sized and of the appropriate type to insure adequate service pressures and flow can be maintained within manufacturer sizing recommendations. The main casing shall be bronze with stainless steel external fasteners. Registers shall be straight -reading type, shall be permanently sealed and shall read in U.S.-gallons. Digital indicator-totalizer shall be sealed and magnetically coupled with the driving mechanism. A leak detector hand shall be provided to indicate very low flow (due to leakage). Connections shall be suitable to the type of pipe and conditions encountered. Register type shall be an encoder-type remote register designed in accordance with AWWA C707. Remote mounting adapter kit with up to 15.24m (50 ft) of cable shall be used to connect the water meter to the remote sensor on the building. Meters shall comply with the accuracy and capacity requirements of AWWA C701. The method of remote monitoring must be coordinated with installation utility systems.

4-9.6.2 Meter Boxes. Meters shall be installed in approved meter boxes or vaults large enough for the installation of a shut off valve and meter and shall be large enough for easy maintenance and removal of meters. Meter registers shall be readily readable with reading ports in box covers provided. Shut off valves shall be provided on each side of meters. Straight pipe sections shall be provided when recommended by the manufacturer. Meters larger than 50 mm (2 inches) shall be provided with bypass line and valve of approved size. Meter boxes set in paved areas subject to vehicular traffic shall be cast iron, or concrete with cast iron lid and cast iron meter reader lid. Boxes set in sidewalks, not subject to vehicular traffic, shall be concrete with cast iron lid and cast iron meter reader lid. Plastic boxes and lids shall not be used. Box height shall extend from invert of the meter to final grade at the meter location. The lid shall have the word “WATER” cast in it.
4-9.6.3 Contractor shall as directed provide to the Contracting Officer for turn over to DPW a minimum of one-meter splice and one spare meter each size installed in this project.

4-9.7 **Water Mains**.

4-9.7.1 Materials for Fire Protection Distribution Main Extension. Materials for the water main shall be in accordance with Army and DPW installation standards. Mains shall be considered as that part of the distribution system that supply fire hydrants. Minimum main size shall be 200 mm (8 inches). Mains shall be ductile iron or Polyvinyl Chloride (PVC). All ductile iron pipes and fittings, to include couplings and valves, shall be wrapped with 8-mil thick polyethylene encasement per AWWA C105. All mains shall be provided with commercial plastic marking tape specifically manufactured for this use. Tracing wire shall be copper solid #10 and shall extend in to valve box stations.

4-9.7.2 Water Main Clearances to Sewers. Water mains shall be laid horizontally 3 m (10 feet) or more from sanitary sewers. Exception is where the bottom of the water pipe is a minimum of 450 mm (18 inches) above the sewer pipe top, in which case, the horizontal separation shall be 1.8 m (6 feet) or greater. Service lines shall have a minimum vertical separation of 300-mm (12 inches) above sewer laterals unless otherwise approved. Where water mains cross within 450 mm (18 inches) above or any distance below gravity flow sanitary sewer lines, the sewer pipe shall be encased with an approved reinforced concrete jacket of 150 mm (6 inch) minimum cover around the pipe to a distance of 3 m (10 feet) horizontally from the water line. Encasement shall start and end at sewer pipe joints.

4-9.8 **Economic Analysis**. Deleted.

4-9.9 **Field Quality Control for Water Distribution**. The contracting officer will conduct field inspections and witness field tests specified. The contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. Water needed for field tests will not be furnished by the government. Do not begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least 5 days after placing of the concrete.

4-9.10 **Bacteriological Disinfection**. Before acceptance of potable water operation, each unit of completed waterline shall be disinfected in accordance with UFGS Section 2510, Water Distribution System and

AWWA C651 unless otherwise specified herein or approved. From several points in the unit, the Contracting officer will take samples of the water in proper sterilized containers for bacterial examination. The unit will not be accepted until satisfactory bacteriological results have been obtained. Contractor shall be responsible for neutralization of and proper disposal of testing and disinfection waters in accordance with State of Hawaii and Tripler Army Medical Center, Preventive Medicine Office, regulations, etc. The chlorinated water may be used for watering grassy areas if the chlorine concentration is reduced to that of drinking water.

4-9.11 **Lead Residual**. Following the bacteriological disinfection and testing, the system shall be flushed with a sufficient velocity of water and sufficient tests performed at each hot and cold water discharge point until no more than 15 ppb lead residuals remain in the system. All test and samples shall be performed in accordance with state and, if applicable, Federal regulations. Samples for testing are to be collected after a 6-hour continuous period of no flushing, and will be considered first draw samples. The commercial laboratory shall be certified by the state's approving authority for examination of potable water. Lead residual tests results shall be submitted to the Contracting Officer. The system will not be accepted until satisfactory bacteriological results and lead test residual test results have been obtained. All flushing and testing for lead residuals, including.

4-9.12 **Interruption of Water Supply**. Contractor shall inform the Contracting Officer a minimum of 45 calendar days in advance of any interruption of service in the existing water system. Valves shall be closed and opened only by DPW authorized personnel unless otherwise approved in writing. Maximum outage shall be 6 hours unless otherwise directed by the Contracting Officer.

4-9.13 **Pressure Reducing Valves**. Main line pressure reducing valves are not required in this project.

4-9.14 **Backflow Protection**. Potable water supplies to fire protection systems, including but not limited to stand pipes and automatic sprinkler systems, shall be protected from backpressure and back siphonage by a double check valve assembly. The valve assembly shall be located down stream of the post indicator valve and before the building riser pipe connection. Double check valve assembly shall in accordance with AWWA C506 and NFPA 24. Valve assemblies shall be of one manufacturer and of the same model for a given size. Domestic and irrigation water systems shall be protected by Reduced Pressure Backflow Preventers.

4-9.15 **Post Indicator Valves**. Every connection from a private fire service main to a building shall be provided with a listed indicating valve so located as to control al sources of water except fire department connections unless other wise approved by the authority having jurisdiction. Post indicator valves shall be located not less than 12.2 m (40 ft) from buildings. When necessary to place a valve closer to a building, the indicator post shall be located at a blank part of a wall.

4-10 **SANITARY SEWERAGE SYSTEM.**

Analysis of Existing System Capacity. Quad C is serviced by a series of 150 mm and 200 mm sewer lines, which collect the wastewater generated on site. The effluent is collected in a manhole located within the courtyard and directed northeast toward Waianae Avenue (SMH S300-50 via a 300 mm sewer main. From SMH S300-5 to SMH S200-2 along Waianae Avenue, the existing sewer main is only 200 mm in diameter. The draft Sewer Infrastructure Study (June 2001) for Schofield Barracks indicates that these lines are inadequate under peak flow conditions. Improvements shall include the following: Replace the existing 200 mm sewer line along Waianae Avenue (between SMH S300-5, S200-1 and S200-2) with a 300 mm sewer line; replace existing building sewer laterals with new 150 mm laterals and provide new sewer manholes and cleanouts as required; Replace existing 150 mm sewer line in courtyard with a new 200 mm line. Provide sewer lateral connection to new covered gear wash. Sediment trap/ basin shall be provided at gear wash facility. Wastewater effluent shall be directed to the sewer system. The existing 150 mm sewer main between sewer manhole S300-19 and S300-15, which recently had CIPP, shall remain (Russell Leong, DPW 6-01).

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4-10.1 Building Sewer Laterals and Connections. Laterals and building connections shall be designed and constructed in accordance with U.S. Army Corps of Engineers Technical Instructions TI 814-10, Wastewater Collection , UFGS standards and the latest edition of International Plumbing Code. Minimum diameter for laterals shall be 150 mm [6 in] while maintaining a minimum velocity of 45 meters per minute [2.5 fps]. Minimum pipe slope for 160 mm [6-inch] shall be 0.6 percent. Lateral shall be sized based upon fixture unit flow.

4-10.1.2 Laterals shall use standard "wye" fittings. Cleanouts shall be provided at all junctions and major bends as directed.

4-10.1.3 Cleanouts shall be 6" cast iron pipe. They shall be installed on all building connections to provide a means for inserting rods in to the underground pipe and installed flush with the finish ground to preclude damage to mower equipment and tripping. Two-way cleanout shall be provided at building connections to permit complete rodding of the building connection. Preferably the cleanout will be of the same diameter as the building sewer, and never smaller than 150 mm (6-inches). Cleanout cap shall be recess type. Cleanout tops in grassed areas shall be provided with a 375 mm (15 inch) square by 150 mm (6 inch) thick concrete collar reinforced with #3 rebar on all sides.

4-10.2 Trenches. Sewer and water lines, mains or laterals, shall be placed in separate trenches. The separate trenches shall maintain a minimum lateral separation of 3m [10 ft].

4-10.3 Minimum Sewer and Water Distribution Pipe Separation Requirements. Parallel water and sewer pipe and crossings between water and sewer pipe shall be in accordance Chapter 4, Site Engineering, sub para. Water Main Clearances to Sewer.

4-10.4 Cover. Coordinate with building connection requirements. To prevent the pipe from being crushed by construction vehicles and the design vehicle, the minimum cover above the top of pipes shall be 750mm [30 in] unless pipe materials are used and/or unless the pipe is concrete encased with a minimum of 150 mm [6 in] thickness of concrete.

4-10.5 Pipe Material for Sewer Laterals. Pipe material for laterals shall be plastic pipe with minimal pipe joints.

4-10.6 Manholes. Manholes shall be constructed of concrete or precast concrete manhole sections with minimum 30" access openings. Ladders shall be stainless steel.

4-10.6.1. Precast manholes shall have eccentric cone tops to permit vertical descent within the manhole.

4-10.6.2 Manholes shall have essentially watertight walls and pipe connections to control ground water infiltration.

4-10.6.3 Manholes deeper than 900 mm (3 feet) shall have stainless steel ladders, Type 316 Stainless Steel (SS).

4-10.6.4 Each new or modified manhole that is located in roads or grass areas that are located in low areas subject to flooding shall be installed with manhole cover inserts to prevent inflow of rainwater; reduce manhole rattling and flipping due to street traffic; and prevent dirt and debris form entering collection system through manhole cover. Manhole insert material and dimensions shall be in accordance with City and County of Honolulu Standards and as specified herein.

4-10.6.4.1 The inserts shall be made of corrosion proof material suitable for atmospheres containing hydrogen sulfide and diluted sulfuric acid as well as other gases associated with wastewater collection. The

body of the material shall be made of high density polyethylene co-polymer, or approved equal that meets ASTM Specifications Designation D1248, Class A, Category 5, Type III, equal to Marlex HXM 50100 (extra high molecular weight hexene co polymer).

4-10.6.4.2 The manhole inserts shall have a minimum impact brittleness temperature of 105 degrees Fahrenheit or less The thickness shall be uniform 1/8-inch or greater. The material shall be firm enough such that the inserts will not fold and fall into the manhole due to any accumulation of debris and water. It shall also be resistant to environmental stress cracking.

4-10.6.4.3. The gasket shall be made of closed cell neoprene. The gasket shall have pressure sensitive adhesive on one side and be placed under the weight bearing surface of the manhole insert by the manufacturer. The adhesive must be compatible with the insert material to form a long lasting bond in wet or dry conditions.

4-10.6.4.4 A lift strap shall be attached to the rising edge of the bowl of the manhole inserts with a stainless steel rivet. The lift strap shall be made of one-inch (1") wide, woven polypropylene web and sheared on all cut ends to prevent unraveling. The inserts shall be sized to fit City and County of Honolulu Standard Type SA manhole frame and covers.

4-10.6.5. New manholes should be located to avoid bends 90 degrees or larger.

4-10.6.6 Drop Manholes, if required, shall be in accordance with City and County of Honolulu standards.

4-10.6.7 Abandoned Manholes and Sewer lines. Abandoned sewer lines should be plugged with concrete at each end. The concrete plug shall extend from the manhole to a minimum 0.6 m (2 ft.) into the abandoned line. Abandoned manholes shall have the bottoms cracked to permit subsurface water drainage though the bottom. The manhole shall be backfilled with (a) compacted granular material, base course or S4C or (b) lean concrete. The manhole cover should be completely removed along with the manhole cone or the upper 1 m or (3 ft.) for cast-in-place manholes.

4-10.7 Pipe material for sewer mains and laterals shall be plastic pipe within minimal pipe joints

4-10.8 Field Quality Control for Sanitary Sewer Distribution System. The contracting officer will conduct field inspections and witness field test specified. The contractor shall perform field tests, and provide labor, equipment, and incidentals required for testing. Water needed for field tests will not be furnished by the government.

4-10.9 Interruption of Sewer System. Contractor shall inform the Contracting Officer a minimum of 45 calendar days in advance of any interruption of service in the existing sewer system. Maximum outage shall be 6 hours unless otherwise directed by the Contracting Officer.

4-10.10. Sewer Pipe Joints. Sewer mains within the tree drip line shall be wrapped at the joints with a 'bio' or root type barrier membrane. Root barrier shall be suitable for pipe joint wrap application and shall be installed in accordance with the manufacturer's specifications.

4-11 **STORMWATER MANAGEMENT SYSTEMS.** The storm drainage system shall be properly coordinated with surrounding properties to ensure that runoff does not cause damage to other

properties. All storm water management calculations shall be based upon a 10-year storm frequency. Design storm water management systems in accordance with the applicable requirements of "Controlling Urban Runoff: A Practical Manual for Planning and Designing Urban BMPS", by the Department of Environmental Programs or in accordance with the requirements of the agency having jurisdiction. The calculation of runoff and the evaluation of existing storm sewer drainage systems shall be as described herein paragraph entitled "Grading and Drainage". Obtain required permits from the agency having jurisdiction prior to construction. Coverage by a National Pollutant discharge elimination System (NPDES) General permit for Storm Water Associated with Construction Activities shall be obtained.

4-11.1 Analysis of Existing System Capacity. The Quad C elevations range from 262.4 meters to 263.3 meters with the low point of the site being the south corner of the complex between Buildings 357 and 358. Presently, the accumulated runoff generated on-site is collected through a series of curb inlets and drain lines and directed to a drain manhole located along Foote Avenue. In addition, downspout roof drains tie into the drainage system at various locations throughout the site. The existing storm drainage system consists of 100 mm; 200 mm and 300 mm drain lines, which are considered to be inadequate.

4-11.2 Storm Water Retention/Detention System for Volume Control. Not required/applicable.

4-11.3 Storm Water Retention/Detention System for Runoff Treatment. Not required/applicable.

4-12 **GRADING AND DRAINAGE.**

Storm drainage system design shall be designed in accordance with City and County of Honolulu Storm drainage Standards and as specified herein or approved. Construction materials, execution and testing shall be in accordance with UFGS/CEGS Specification Section 2630a, Storm Drainage System; and as specified herein or approved.

4-12.1 The proposed drainage improvements should include the following (drain line sizes provided are preliminary and should be verified by the civil designer):

System design and capacity requirements should accommodate 10-year design flows.
Install new 150 mm downspout laterals and cleanouts, as required.
Install new 200 mm downspout drain line at the building perimeters. Downspout laterals should tie into new 200 mm downspout drain line at designated points along the building perimeters.
Remove and replace existing curb inlets within Quad C.
Install new 300 mm, 450 mm and 600 mm drain lines, as required to provide for adequate drainage of the site. Install additional drain inlets, as required.

4-12.2. Connections to Existing Systems. Connections to existing systems shall be made at locations as indicated on the drawings or as approved.

4-12.3. Grading and drainage design shall be properly coordinated with surrounding properties and facilities to insure that runoff do not cause damage outside of the project limits. Existing drainage patterns shall be maintained as much as practicable.

4-12.4. Sumps and low points where water ponds shall be avoided whenever practical so as to preclude

flooding of buildings and roads when design capacities of drainage systems are exceeded. Where sumps can not be avoided, higher design capacities may be directed for systems draining the sumps and positive overland flow relief provided to preclude flooding of dwelling units and critical utility appurtenances such as electrical transformers.

4-12.5. Inlets and Manholes.

4-12.5.1. Materials shall be of cast-in-place reinforce concrete or pre-cast reinforced concrete sections. Precast manholes shall have eccentric cone tops to permit vertical descent within the manhole.

4-12.5.2. Locate manholes or inlets at intersections, changes in alignment or grade or size, at junctions with laterals of branches or wherever entry for maintenance is required. Storm drain inlets shall be located so that no collection swales flow across a street or sidewalk to reach a storm drain other than where cross gutters are used. For streets and roadways, side opening catch basins are preferable. Distance between points of entry will not be more than 90 meters (300 feet) for conduits with a minimum diameter smaller than 30 inches and up to 150 meters (500 feet) for diameter 30 inches or larger.

4-12.5.3. Inside dimensions of manholes will not be less than 0.760 meter (2.5 feet). Inside dimensions of inlets will provide for not less than 75 mm (3-inches) of wall on either side of the outside diameter of the largest pipe involved or not less than 0.760 meter (2.5 feet), which ever is greater.

4-12.5.4. Manhole frame and cover shall be round will a minimum clear opening of 760mm (30 inches).

4-12.5.5. Manholes and inlets deeper than 900 mm (3 feet) shall have a fixed stainless steel ladder, Type 316 Stainless Steel (SS).

4-12.6. Open ditches and channels are not allowed unless specifically approved. Grassed swales shall have a one (1) percent minimum invert slope unless the invert is paved with and approved concrete lining. Open areas shall be drained by field inlets and an underground collection system, utilize existing system as much as possible. Overland flow shall be held to a minimum. Swales shall have cross-sections that do not restrict the use of powered mowing equipment.

4-12.7. All streets shall be crowned or sloped to drain. Concrete gutters shall be provided on both sides of streets. Street drain inlets shall be curb opening type. Drop inlets with grates are not allowed.

4-12.8. Maximum Gutter Flow. Maximum flow in all gutters shall be restricted to the quantity, which will cause flooding of 1/2 of the adjacent traffic lane at the design storm. When this flow is reached, it shall be intercepted by catch basins and removed to an underground drainage system.

4-12.9. Minimal size for drain pipes along roadways and vehicle traffic areas shall be 450 mm (18-inches) and pipe material reinforced concrete. Minimal pipe size for all other areas shall be 300 mm (12-inch) and

materials shall be reinforced concrete pipe, schedule 40 PVC pipe, or smooth interior corrugated polyethylene pipe. For corrugated polyethylene pipe, the couplings joints shall be the watertight type.

4-12.10. Storm Runoff Calculation. Storm runoff shall be calculated with consideration for the following:

4-12.10.1 Select design values to be used in the storm drainage design calculations, including rainfall intensity, drainage area, and runoff coefficients.

4-12.10.2 Select storm drainage plan with respect to planned connections to the existing storm drainage system, when applicable.

4-12.10.3 Alternate schemes considered in arriving at selected storm drainage plan.

4-12.10.4 Principal means of collection and disposal of storm water in the new storm drainage system. Include calculations for runoff, sizing of pipe and drainage structures (inlets and drainage control structures and roof drainage pipe).

4-12.10.5 Method proposed for handling roof runoff from gutter downspouts (roof drain collector system into drainage system).

4-12.10.6. Connections of building's mechanical drains to outside drainage system, where applicable, and cross referencing to the appropriate section and design discipline, when required.

4-12.11 Specific Storm Drainage Criteria.

A 10-year 1-hour intensity design storm shall be used to calculate the runoff. The time of concentration (Tc) for storm drainage system shall be no less than 10 minutes for paved areas and 20 minutes for turfed areas. Runoff shall be controlled by a storm drainage system properly designed to eliminate erosion.

Storm drainage systems will be so designed that the hydraulic gradeline for the computed design discharge in as near optimum depth as practicable and velocities are not less than 0.760 m/s2.5 feet/s when drains are one third or more full.

4-12.12 Sidewalk Culverts. Sidewalk culverts are not permitted.

4-12.13 Materials. All materials shall be in accordance with the criteria indicated above.

4-12.14 Field Quality Control for Storm Drainage System. The contracting officer will conduct field inspections. Testing procedures and requirements shall comply with the requirements indicated above.

**4-13 PAVEMENT DESIGN CRITERIA. For bidding purposes, the pavement design shall be in**

**accordance with the preliminary soils report. The final soils report by the successful bidder will determine the final pavement design. Concrete curb and curb/gutter shall be as shown on the drawings and this RFP. For streets and roads, the design vehicle traffic and anticipated volume will be given to the successful bidder.**

4-14 **PERMIT REQUIREMENTS.** Timely acquisition of all the necessary design and construction related permits shall be the responsibility of the contractor. As some permit process times take 6 months or more, the Contractor, upon notice to proceed, shall immediately begin working on the permits so as not to delay completion of the project. The following permits have been identified as being required for this project: State Department of Health Individual Wastewater Permit, U.S. Army Garrison Hawaii, Excavation Permit, Demolition Permit, County of Hawaii Disposal Permit and any other permits as required by the installation, County and State Government.

**4-15 GAS DISTRIBUTION SYSTEM**.

4-15.1 General: The site gas distribution system shall be coordinated with The Gas Company. The site gas system shall be sufficiently sized for the central plant hot water generation system and the Dining Facility, Bldg. 357.

**4-16 HEATING HOT WATER AND CHILLED WATER DISTRIBUTION.**

4-16.1 General: TI 810-32, Heating and Cooling Distribution Systems provides baseline design criteria, standards, policy and guidance for the design of the heating hot water and chilled water distribution systems. Designs shall be compatible with existing construction provided this does not conflict with criteria, standards and policy in TI 810-32.

4-16.1.1 Codes: Electrical systems and installation requirements shall adhere to the current editions of UFGS 02555A, Prefabricated Underground Heating/Cooling Distribution System.

4-16.1.2 Standards: All materials and appurtenances provided under this contract shall be suitable for the intended application and shall conform to the current edition of applicable standards of references indicated in UFGS 02555A, Prefabricated Underground Heating/Cooling Distribution System.

Where no such standards exist for any product provided under this contract, the Contractor shall demonstrate the suitability of the product, for the application intended, to the satisfaction of the Contracting Officer.

4-16.3 Calculations and Diagrams: Complete plans and diagrams shall be provided with calculations of flow and pressure. Diagrams, calculations, and drawings shall be prepared under the supervision of a United States registered professional mechanical engineer.

4-16.3.1 Pipe size: The size of pipe shall be selected such that flow velocity not exceed 2.13 m/s (7 fps).

4-16.4 Buried Pipes

4-16.4.1 Thrust Blocks: Thrust blocks shall be provided at any change in pipe direction. Thrust blocks shall be designed and shall be of sufficient size to prevent movement of the pipe due to change in flow.

4-16.5.1.2 Direct Buried Pipes: Pipes shall be prefabricated, insulated pipes with steel carrier pipe and PVC jacketing. Where bottoms of trenches comprise materials other than sand or stone-free earth, 76 mm (3-inch) layers of sand or stone-free earth shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts in direct-contact tiered fashion. Joints in adjacent tiers of duct shall be vertically staggered at least 152 mm (6 inches). The first 102 mm (4-inch) layer of backfill cover shall be sand or stone-free earth compacted as previously specified.

4-16.5.1.3 Duct Line Markers/Plastic Marking Tapes: Duct line markers shall be provided at the ends of

long pipe runs or for other piping whose locations are indeterminate because of changes in direction or terminations at completely below-grade structures. A 5-mil brightly colored plastic marking tape not less than 152 mm (6 inches) in width and suitably inscribed at not more than 3048 mm (10 feet) on centers with a continuous metallic backing and a corrosion resistant 1-mil metallic foil core to permit easy location of the pipe, shall be placed approximately 305 mm (12 inches) below finished grade levels of such lines.

**4-17 STEAM DISTRIBUTION.** Deleted..

**4-18 FUEL OIL STORAGE AND DISTRIBUTION.** Deleted..

**4-19 LIQUEFIED PETROLEUM GAS STORAGE AND DISTRIBUTION.** Deleted.

# CHAPTER 5

## ARCHITECTURAL DESIGN

**5-1 DESIGN GOALS.** Overall architectural goals for the Whole Barracks Renewal Brigade Complex QUAD C are to provide a functional, visually appealing campus of facilities that is a source of pride for residents, other facility users, and the installation. This chapter applies to all buildings under this RFP unless specifically noted otherwise.

5-1.1.1 The architectural floor plan is established and approved as shown in the RFP Concept Design Drawings. All architectural criteria must be met and accounted for, see paragraph 5-2 Applicable Codes and Standards. Any changes shall be brought to the attention of the Contracting Officer for resolution in writing.

5-1.1.2 Furnishings, Fixtures and Equipment (FF&E): FF&E is part of this project. Fixtures and Equipment (lighting, plumbing, mechanical equipment, etc.) described for programmed spaces shall be provided by the offeror as part of the base bid. Interior Furnishings (tables, chairs, sofa, bed, etc.) will be Government furnished and installed. Refer to SOW Chapter 2, para. 2-1.7 for scope of Furnishings, Fixtures, and Equipment that will be required to be provided by the offeror. Any furniture layout depicted in the RFP concept design drawings will be adhered to and not deviated from without approval of the customer. The number and location of furnishings serve as an indicator of the number of power, data and communications connection points. See electrical section for more detail.

5-1.2 **Existing Quad Building Background and New Space Planning Intent**
The existing Quad consists of four buildings-three stories each - constructed in 1917. The buildings were originally open sleeping and living spaces and until recently, a mixture of office and living spaces.

5-1.2.1 Building 355: ground floor will be used for heavy equipment storage for four medium and one large Company Operations Facilities (COFs). The second floor is designated for the Administration Offices for three medium COFs. The third floor is designated for the Administration Offices for one medium COF and one large COF. Also, the third floor will contain the existing refinished Gymnasium. The total area of Building 355 is approximately 6,160 SM.

5-1.2.2 Buildings 356 and 358: is reserved exclusively for Unaccompanied Enlisted Personnel Housing (UEPH), Laundry Room, and Game Room. It will have 50 sleeping rooms per floor for a total of 150 rooms per building. The total area of Building 356 & 358 is approximately 6,820 SM per building.

5-1.2.3 Building 357: ground floor will be designated as the Dining Facility; the space includes: Kitchen, sit down dining area, and dining support spaces. The second floor will have Soldier Support Services, Soldier Community Functions, Troop Aid Station, COF Restroom facilities, Dining area, and Classrooms. The third floor will contain the Battalion HQ functional spaces and Battalion Restroom facilities. Building 357 is approximately 6,966 SM.

5-1.2.4 The selected offeror will be required to demolish all of the existing interior partitions as well as the complete flooring system in the toilet and shower areas. Also, the selected offeror will be required to determine the location of existing partitions with respect to the proposed Concept Design Drawings, in order to remove as required. This may include concrete masonry walls that are not structural. The roof structure and roofing will also have to be removed for Buildings 356, 357, and 358. All buildings will require the removal of existing windows and doors and provide a larger opening to install new fenestrations (door & windows) as designed to meet the approval of State Historic Preservation Office (SHPO). Adjacent wall finishes, both interior and exterior shall match the existing surfaces before the new windows are installed. Additionally, all existing plumbing, mechanical and electrical items need to be removed as indicated.

5-1.2.5 The Quad C building renovation design intent is to follow the Department of the Army Facilities Standardization Program for a Standard Company Operations Facility, Battalion Headquarters, and Dining

Facilities.

5-1.3 **Exterior Design Objectives**. Design buildings to enhance the visual environment of the installation. Exterior materials, roof forms, and detailing shall comply with the Installation Design Guide and concept design drawing, and shall be compatible with the immediate local context. Use durable, low-maintenance materials.

5-1.4 **Interior Design Objectives**. Arrange spaces in an efficient, functional manner. Provide simple circulation schemes that allow easy way finding within buildings. Use durable materials and furnishings that can be easily maintained and replaced. Maximize use of day lighting and operable windows. Use interior surfaces that are easy to clean and light in color; avoid trendy or bright color schemes. Provide telephone/data jacks on multiple walls to allow optional locations for furniture. Structure interior spaces to allow maximum flexibility for future modifications; companies and battalions often change size or mission, requiring reconfiguration of facilities. Refer to SOW Chapter 14-Comprehensive Interior Design for detailed information and CID Package requirements.

5-1.5 **Material and Product Selection Criteria**. Materials shall meet the requirements of the SOW. The SOW includes a range of specificity: some material requirements are specific (no option); other material requirements allow a range of options. The SOW requirements establish a minimum quality level.

**5-2 APPLICABLE CODES AND STANDARDS**. Except as specified otherwise in the RFP, design and construction of facilities shall comply with the latest editions (as of the date of the RFP) of the following. Major criteria and references for building design are as listed but not limited to this list. Additional requirements are included throughout the RFP.

5-2.1 National Fire Codes, published by the National Fire Protection Association (NFPA), including NFPA 101 Life Safety Code.

5-2.2 International Building Code (IBC), 2000

5-2.3 Americans With Disabilities Act Accessibility Guidelines for Buildings and Facilities (ADAAG), 1998.

5-2.4 Unified Facilities Criteria (UFC) 4-010-01 Department of Defense Minimum Antiterrorism Standards for Buildings July 31, 2002.

5-2.5 AR 190-11, Physical Security of Arms, Ammunition, and Explosives, Change 1, Appendix G, para G-2.

5-2.6 American Architectural Manufacturer's Association (AAMA)

5-2.7 Architectural Woodworking Institute, AWI Quality Standards

5-2.8 Builders Hardware Manufacturers Association, ANSI/BHMA

5-2.9 Underwriters Laboratories.

5-2.10 Tile Council of America (TCA) Handbook for Ceramic Tile Installation.

5-2.11 The Schofield Barracks Installation Design Guide (IDG), excerpts of which are included in an appendix to the Statement of Work.

5-2.12 UFC 3-600-01 Design: Fire Protection Engineering for Facilities (17 April 2003)

5-2.13 TI 800-01, Design Criteria, 20 July 1998

5-2.14 UFC 1-200-01, Design: General Building Requirements, July 31, 2002

5-2.15 Department of the Army Facilities Standardization Program, Standard Company Operations Facility, Dated February 1994.

5-2.16 Department of the Army Facilities Standardization Program, Standard Design for Brigade and Battalion Headquarters Facility, Dated August 1995.

## 5-3 IBC OCCUPANCY AND BUILDING TYPE CLASSIFICATIONS.

5-3.1 **General**. Occupancy classifications, construction types, allowable areas, maximum building heights, and fire separation requirements shall comply with the requirements of the International Building Code. Prior to issuance of the RFP, the design district shall coordinate with the authority having jurisdiction to determine occupancy classifications. Consult with the users to determine the hazard classification of items to be stored in the supply spaces.

5-3.2 **Construction**: All four building are Type II-A structures. All structural components, floor construction, bearing walls, and the roof shall be constructed of one-hour fire resistive construction.

5-3.3 **Occupancy Classification.** The IBC occupancy classification for the quad is as follows. Buildings 356 and 358 are both a Group R-2 occupancy. Building 355 is a mixed occupancy. The first floor is a Group S-1. The second floor is a Group B and Group S-1. The third floor is a Group A-3 and a Group B. Building 357 is also a mixed occupancy. The first floor is a Group A-2 and Group B. The second floor is a Group B and Group S-1, and the third floor is a Group A-3, Group B, and S-1.

5-3.4 **NFPA Classification**. The NFPA 101 classification for the quad is: Buildings 356 and 358 are both New Apartment Building occupancies. Building 355 is a mixed occupancy. The first floor is a Storage occupancy. The second floor is a New Assembly occupancy, New Business occupancy and a Storage occupancy. The third floor is a New Assembly occupancy, and a New Business occupancy. Building 357 is also a mixed occupancy. The first floor is a New Assembly occupancy, and a New Business occupancy. The second floor is a New Business occupancy and a Storage occupancy, and the third floor is a New Assembly occupancy.

5-3.5 **UEPH Buildings**. Occupancy classification: Residential R-2.

5-3.6 **Company Operations Facilities** Occupancy classification of administrative areas, and locker room facilities serving less than 50 occupants: Business Group B. Common Locker Rooms for 50 or more occupants: Assembly Group A-Division-3. Occupancy classification for supply areas: Storage Group S, Division 1 (or Division 2- verify contents of space with user).

5-3.7 **Battalion Headquarters**. Occupancy classification of administrative areas: Business Group B. Occupancy classification of classroom areas: Assembly Group A-3.

## 5-4 EXTERIOR DESIGN.

5-4.1 **General** the buildings are considered historical and any exterior construction shall be sensitive to the original design. See the Historic Narrative for detailed narrative on the historic importance, general design intent and requirements, see SOW 15. The exterior design should closely replicate the original 1917 design. The Concept Design Drawings contrast the original design where the building must

conform to NFPA 101, Life Safety Code. Some of the areas include the exterior stairways; rated partitions and doors are added to enclose the stairs. Also, some window and door openings were removed to provide a separation when enclosing the stairs was not practical.

5-4.2 **Acceptable Materials and Colors**. Exterior elements of the facilities shall comply with the attached architectural concept design drawings and the Installation Design Guide (IDG) unless required otherwise by applicable codes or this Statement of Work

5-4.3 **Quad Building Superstructure:** No specific requirement for the type of structural system is imposed other than to meet the applicable regulations, to dimensionally fit within the space allocated for structure and to accommodate the exterior materials shown on the exterior elevations and building sections.

5-4.4 **Detached Building Structures.** Concept design is based on a load-bearing masonry exterior wall with a manufactured steel truss roof structure.

5-4.4.1 Alternative pre-cast concrete beams or trusses, pre-engineered steel structure, or conventional steel rafter / purlin systems.

5-4.5 **Exterior Closure:**

5-4.5.1 **Exterior Finishes**. Emphasis shall be placed on low maintenance and durability for exterior finish materials. Materials shall be residential in size, scale, and texture. Exterior wall materials shall be painted concrete or concrete masonry unit:

5-4.5.2 Termite decay and protection for exterior wood materials (siding, trims, etc.) shall be in accordance with National Wood Window and Door Association (NWWDA) Standards. Each piece of treated material shall bear identification of the testing agency to indicate performance in accordance with NWWDA.

5-4.5.3 Trim elements. Aluminum or vinyl clad wood trim is preferred over painted or stained wood trim. Painted exterior surfaces shall be minimized. When exterior exposed wood trim is used the following requirements apply:

5-4.5.4 Exposed wood, such as window trim, door sills, window sills, railings and balusters, trellis, wood fencing, arbors, solar shading devices including louvers, arbors, and trellis shall be treated for rot resistance in accordance with NWWDA Industry Standards I.S.4, Water Repellent Preservative Treatment for Millwork.

5-4.5.5 Exterior surfaces requiring painting shall receive a minimum of one prime coat and two finish coats of paint. Wood trim frames, etc., shall be back primed. Exterior semi-transparent low sheen stains, two coats, are acceptable, where appropriate for wood, plywood, etc.

5-4.5.6 Existing exterior stair treads and landings shall be provided with non-slip type treads. Existing exterior stairs shall be provided with metal railings.

5-4.6 **Roofs.** Roofing material and color shall comply with the attached architectural concept design drawings. Roofing system shall have Underwriters Laboratory (UL) Class A rating for fire resistance, UL 90 wind resistance rating, and Factory Mutual (FM) 1-90 fire and wind resistance rating.

5-4.6.1 **Quad Building, Chiller Plant Building and Pump House Building Roofs**. Built-up roofs shall have a minimum pitch of 1:24 (1/2-inch: 1 foot.).

5-4.6.1.1 **Built-Up Roofing**. Provide 4-ply, built-up roofing for use over rigid board insulation on metal decking for Quad Building Roofs. Provide 4-ply, built-up roofing for use over rigid board insulation on concrete slab of metal decking for Chiller Plant and Pump House Building. Provide manufacturers 20-year finish warranty.

5-4.6.2 **Gear Wash/Recreation Building Roofs**. Gear Wash/Recreation Building shall have sloped roof with a minimum pitch of 4:12. Refer to Attachment #25, Quad F Gear Wash/Recreational Building Sketches.

5-4.6.2.1 **Metal Roofing**. Standing seam steel or aluminum roof panels with integral or metal fascias. Provide manufacturers 20-year finish warranty.

5-4.6.3 **Roof water.** Conductor heads, scuppers and downspouts shall be provided for all roof areas. Provide calculation of gutter and downspout size if the existing conductor heads, scuppers and downspout dimensions cannot be determined. Calculations should be in accordance with SMACNA-03, Architectural Sheet Metal Manual. Provide 20-year manufacturers finish warranty. Downspouts draining onto a lower roof shall have metal or plastic splash deflectors. Downspouts shall be connected to the underground storm drainage system. Provide cast iron boot at the bottom of all downspouts.

5-4.6.4 **Rainfall Calculations**: Conductor heads, scuppers and downspouts shall be adequately sized to meet the following Design Rainfall Intensities:

Schofield Barracks: Design Rainfall Intensity (hourly in inches for a 5-minute period to be expected once in 10 years) = 188 mm (7.4 inches).

5-4.6.5 **Roof surface**. Roof surfaces shall be light colored to minimize heat gain. Roof water shall be diverted away from entrances and foundations.

5-4.6.6 **Roof Eave.** Existing Quad Building roof eave shall be removed and restored to its original Historic design and character. Use durable, low-maintenance materials. Refer to Architectural Concept Design Drawings for detail reference.

5-4.6.7 **Sheet Metal Work**. All Sheet metal material shall be copper.

Note: Flashing - Continuous stepped flashing to be installed at wall adjacent to roof slope. Design to facilitate easy maintenance and removal of roofing without removing or damaging the wall sidings. Provide metal drip edge of flashing at roof eaves.

5-4.7 **Trim and Flashing**. Materials shall comply with the RFP concept design drawings. Gutters, downspouts, and fascias shall be copper; comply with SMACNA Architectural Sheet Metal Manual; provide 20-year manufacturers finish warranty.

5-4.8 **Miscellaneous Exterior Elements**. Comply with the attached architectural concept design drawings. It is advisable to prohibit any use of exterior wood with painted finish; require pre-finished metal trim. Coordinate with user to include requirements for any building-mounted operational items such as communications antennae, special lighting, warning beacons, etc.

5-4.9 **Exterior Doors and Frames**.

5-4.9.1 **Doors**. Provide Historic doors as indicated on the concept design drawings. Refer to RFPconcept design drawings for door types and details. Fully glazed doors shall comply with wind load requirements of applicable codes. Telecomm Room doors shall be secured per AR 380-19 Information Systems Security.

5-4.9.4.1 **Hollow Metal Doors and Frames**. comply with ANSI A250.8/SDI 100. Doors shall be Level 3, physical performance Level A, Model 2; insulated; top edge closed flush. Frames shall be Level 3, 14 gauge, with continuously welded corners and seamless face joints. Doors and frames shall be constructed of hot dipped zinc coated steel sheet, complying with ASTM A653, Commercial Steel, Type B, minimum

A60 coating weight; factory primed. Anchors and accessories shall be zinc coated. Frames in masonry shall have bituminous back-coating, plaster guards, and shall be grouted solid. Provide concealed wall and head anchors in frame sufficient to support the weight of the grouted frame. Provide minimum four concealed wall anchors at masonry rough openings. Provide minimum one concealed head anchor for frame rough openings greater than three feet. Fire-rated openings shall comply with NFPA 80, and the requirements of the labeling authority.

5-4.9.5 **Exterior Door Finish Hardware**.

5-4.9.5.1 **Hinges**. ANSI/BHMA A156.1; template, full mortise, heavy duty, anti-friction ball bearing, minimum size 114 mm x 114 mm [4 ½" x 4 ½ "], stainless steel, non-removable pins.

5-4.9.5.2 **Locksets for Typical Exterior Door**. Provide stand-alone programmable electronic door locksets with audit capabilities. The lockset construction shall be all-metal, heavy-duty, and mortise. The lockset is equipped with hidden mechanical key override, an anti-pick latch and dead bolt, and a magnetic stripe reader. Each magnetic stripe card will be programmed to gain access into its respective module and sleeping/living rooms. Lockset shall be similar to Kaba Ilco, Solitaire 710-II Series or approved equal. The lockset shall include knob and lever torque test and "Ultra" finish with two-year warranty.

5-4.9.5.3 **Locksets for Typical Exterior Utility and Maintenance Doors**. spaces with doors covered by this paragraph include: Mechananical Rooms, Electrical Rooms, Telecommunication Rooms, Communication Rooms, Toilets, Janitor, and Stairwell. ANSI/BHMA A156.13; series 1000, grade 1, mortise lockset with removable core, non-ferrous base metal.

5-4.9.5.4 **Exit (Panic) Devices**. ANSI/BHMA 156.3; heavy-duty touch-pad type, through-bolted mounting. Listed and labeled for panic protection based on UL 305. Doors shall be provided with exit device if required by Building Code.

5-4.9.5.5 **Closers**. ANSI/BHMA A156.4; series C02000, Grade 1, hydraulic, factory-sized, adjustable to meet field conditions. Provide for all exterior doors, all doors to living units, and all doors opening to corridors and as required by codes. At exterior doors to lobbies, corridors, mechanical rooms, janitors closets, and COF supply areas provide overhead holders or closers with hold-open capability.

5-4.9.5.6 **Auxiliary Hardware**. ANSI/BHMA A156.16. Provide wall or floor stops for all exterior doors that do not have overhead holder/stops. Provide solid wood backing in the stud wall cavity for wall-mounted doorstops. Provide other hardware as necessary for a complete installation.

5-4.9.5.7 **Thresholds**. ANSI/BHMA A156.21; non-ferrous metal. Provide at all exterior doors. Provide inter-locking type threshold for UEPH Building 356 & 358 Living Unit only (threshold for Interior corridor door).

5-4.9.5.8 **Weatherstripping**. ANSI/BHMA A156.22. Provide at all exterior doors.

5-4.9.5.9 **Kick Plates**. ANSI/BHMA A156.6; stainless steel, 254 mm [10"]high x 51 mm [2"] less than door width. Provide at push side of all doors with closers.

5-4.9.5.10 **Locks and keys**. Lock cylinders shall have six pin tumblers and interchangeable cores, which are removable by a control key. Provide a master keying system. Locks for each organizational unit, including exterior storage shall be keyed alike. Contractor shall obtain the key bitting report from the hardware manufacturer and provide the report to DPW at the end of the project. Locks and keys shall conform to the standards and requirements of the Builders Hardware Manufacturers Association (BHMA) listed above.

5-4.10 **Exterior Windows**. Provide Historic windows as indicated on the concept design drawings. Refer to concept design drawings for window types and details. Fully glazed windows shall comply with

wind load requirements of applicable codes. All sleeping rooms shall have operable windows complying with egress requirements of applicable codes. Windows shall be operable and shall have locks.

5-4.10.1 **Screens.** Fiberglass screens shall be provided at all operable windows and be of window manufacturer's standard design. Fiberglass insect screens, 18 x 16 mesh size, shall be provided for all windows and sliding glass doors and should be the window or door manufacturers standard design for use with the windows and doors being provided. Insect screen frames shall be removable type for easy cleaning.

5-4.10.2 **Exterior Glass and Glazing**. To comply with force protection minimum standards: Single glazing and the inner pane of insulated glass assemblies in exterior windows and doors shall be minimum 6 mm (1/4-inch) annealed laminated glass.

5-4.11 **Insulation**. Insulation shall be provided to meet the following requirements:

5-4.11.1 Thermal and sound insulation shall have a flame spread rating of 25 or less and a smoke development rating of 50 or less exclusive of the vapor barrier when tested in accordance with ASTM E 84. A vapor barrier shall be provided on the warm side of exterior and ceiling insulation for thermal insulation.

5-4.11.2 Urethane is not allowed as an insulation material.

5-4.11.3 Polyicyene expanding foam insulation will be permitted as a material to insulate ceilings and walls.

5-4.11.3 **Thermal Insulation**. Provide exterior wall, floor, and roof/ceiling assemblies with thermal transmittance (U-values) required to comply with the proposed energy calculations for the facilities. Insulation shall not be installed directly on top of suspended acoustical panel ceilings.

5-4.12 **Louvers:** Aluminum-framed louvered panels. Louver finish shall be Kynar 500 or approved equal. Kynar 500 properties: a fluoroploymer-polyvinylidene fluoride (PVDF). Finish shall be factory applied and oven baked. Total overall dry film thickness shall be 0.025mm (1mil) thick.

5-4.13 **Exterior Railings**. All exterior handrails and guardrails shall be replaced. Existing railing design does not conform to original historic design for Quad C. Design of exterior handrails and guardrails shall conform to historic character of Quad C. The design shall be coordinated with the State Historical Preservation Office. Exterior railing materials, including bolts and fasteners shall be painted hot-dipped galvanized steel. Design shall comply with all applicable codes. Final handrail design shall be approved by DPW.

## 5-5 INTERIOR DESIGN.

### 5-5.1 Floors and Flooring Material

5-5.1.1 **Floors**. Comply with requirements of applicable codes. Non-combustible construction is preferable, even where combustible materials are allowed by code. Floor finish materials shall be as specified in functional and area requirements listed in Chapter 2 of the Statement of Work.

5-5.1.2 **Quarry Tile.** will be the abrasive surface type as stated in the Tile Council of American Standard 137.1 (Ceramic Tile). Epoxy coatings, linoleum, vinyl and VCT are not acceptable substitutes for quarry tile. Grouting material for quarry tile shall be a grout system employing epoxy resin and hardener portions especially formulated for commercial installations where chemical resistance is important. All grout joints shall be sealed.

5-5.1.3 **Ceramic Tile**. Comply with ANSI A 137.1 and the recommendations of Tile Council of America (TCA) Handbook For Ceramic Tile Installation. Provide marble threshold under doors where a ceramic tile

floor meets a different floor finish. All grout joints shall be sealed.

5-5.1.4 **Vinyl Composition Tile.** Vinyl composition tile shall conform to ASTM F 1066, Class 2, through pattern tile, Composition 1, asbestos-free, and shall be 12 inches square and 1/8 inch thick. The tile shall have the color and pattern uniformly distributed throughout the thickness of the tile. Flooring in any one continuous area shall be from the same lot and shall have the same shade and pattern.

5-5.1.5 **Resilient Base.** Base shall be manufacturers standard rubber, coved style (installed with resilient flooring). Base shall be 4 inches high and a minimum 1/8-inch thick. Job formed corners shall be provided.

5-5.1.6 **Carpet.** Carpet construction shall be woven; Type: Broadloom 3.6m minimum usable carpet width; Pile Type: Level Loop; Pile Fiber: Commercial 100% branded federally registered trademark nylon continuous filament; Pile Height: minimum 3.4mm in accordance with ASTM D418; Yarn Pile: minimum 2; Pile density: minimum 4696; Dye method: solution dyed; backing material: backing material shall be 100% synthetic material. Static control shall be provided to control static buildup to less than 3.5 kV when tested at 20% RH and 21 degrees C in accordance with AATCC TM 134.

5-5.1.7 **Concrete Floors**: All concrete floors on the first floor of all Quad C Buildings that will receive vinyl composition tile or carpet shall be provided with hardener/sealer that conforms to the following requirements:

5-5.1.7.1 Qualifications: the installer of hardener/sealer shall be certified and shall be on a list of preapproved applicators of the product.

5-5.1.7.2 Technical Representative: Hardener/sealer manufacturer's Technical Representative shall be made available for initial training of applicators and field observation during installation of the hardener/sealer. Technical Representative shall certify installations for warranty.

5-5.1.7.3 Warranty: Hardener/sealer manufacturer's "Full System 10 year warranty" on the replacement of all flooring material and labor that delaminates due to moisture migration, excessive vapor emissions or contaminates, shall be provided on all concrete floors to receive carpet and resilient flooring.

5-5.2 **Interior Walls and Partitions**. Comply with requirements of applicable codes. Non-combustible construction is preferable, even where combustible materials are allowed by code. The use of 16 mm [5/8"] Type X gypsum board shall be utilized where drywall partition is required.

5-5.2.1 Offices and Administration areas are to have full height drywall on metal stud partitions with sound insulation. The use of 16 mm [5/8"] Type X gypsum board shall be utilized where drywall partition is required.

5-5.2.2 Interior walls: Masonry or concrete walls at Arms Room, Heavy storage areas for the Company Operation Facilities (COF) shall have full height masonry or concrete walls.

5-5.2.3 Arms Vault needs to meet requirements at AR 190-11, Physical Security of Arms, Ammunition, and Explosives. Additional Arms Vault requirements are explained in SOW Ch 5, paragraph 5-7.2 and SOW Ch 6, paragraph 6.5-4

5-5.2.4 Interior seismic walls: these walls will be made of concrete. The wall finish shall be smooth; no visible snap-ties or formwork is permitted. These walls will be furred with 64 mm [2-1/2"] metal studs and gypsum board.

5-5.2.5 **Metal Support Systems**. Non-load bearing metal studs and furring shall comply with ASTM C 645; stud gauge shall be as required by height and loading, but shall not be less than 25 gauge. Maximum

stud spacing: 406 mm [16”] on center. Provide galvanized finish.

5-5.2.6 **Gypsum Board**. Comply with ASTM C 36. Minimum panel thickness: 16 mm [5/8”]. Provide Type X panels in fire-rated assemblies. Provide moisture resistant panels at locations subject to moisture. Provide abuse-resistant panels where indicated in functional and area requirements. Joint treatment: ASTM C 475. Screws ASTM C 646. Drywall installation: ASTM C 840.

5-5.2.7 **Ceramic Tile**: Comply with ANSI A 137.1 and the recommendations of Tile Council of America (TCA) Handbook For Ceramic Tile Installation. Substrate for wall tile shall be cement backer board (gypsum board is not acceptable).

5-5.2.8 **Concrete seismic wall on existing concrete wall:** these conditions occur at the exterior facing concrete walls. The finish surface shall be smooth for paint application.

5-5.3 **Telecommunication Room (Tele)**

5-5.3.1 Require coordination with Schofield Barracks Physical Security Office, Harold Evans, and the Directorate of Information Management, Marion Robinson.

5-5.3.2 Telecomm. rooms which may house SIPR servers shall be treated as classified open storage areas.

5-5.3.3 Security for Telecomm rooms shall be per AR 380-19 information systems security.

5-5.4 **Ceilings**. Non-combustible construction is preferable, even where combustible materials are allowed by code. Ceiling finish materials shall be as specified in functional and area requirements listed in Chapter 2 of the Statement of Work, as indicated on the Concept Design Drawings, and comply with requirements of applicable codes. Textured ceiling finish may be provided in areas other than laundry or bathrooms. Interior finish on walls and ceilings shall be in accordance with NFPA 101. Provide access doors to maintain and service equipment above the ceiling.

5-5.4.1 **Acoustic Ceiling Tile**. Acoustic tile shall be smooth, nondirectional finish on scratch-resistance surface. Acoustic tile shall be washable, humidity resistant, and soil resistant. Provide acoustic tile complying with Class A: Flame Spread 25 or under (UL Labeled) per ASTM E 1264; NRC: 0.70 minimum; CAC: 35 minimum; Light Reflect Coefficient: 0.89 minimum.

5-5.4.2 **Fiberglass Ceiling Tile.** Fiberglass ceiling tile (frp) shall beis easy-to-clean panel and made of fiberglass reinforced plastic. Panel surface allows dirt and grease to be cleaned off quickly and easily. As a frp panel it is extremely resistant to most stains and chemicals. The entire panel is moisture resistant and does not support mold or mildew, and it will not rust or corrode. Provided fiberglass tile complying with Class A: Flame Spread 25 or under (UL Labeled) per ASTM E 1264. Light Reflect Coefficient: 0.89 minimum.

5-5.5 **Interior Doors and Frames**. Provide hollow metal doors, or flush wood solid core doors at UEPH and administration spaces. Provide hollow metal doors at COF supply spaces. All frames shall be hollow metal. Hollow metal doors and frames shall have a minimum A60 galvanizing. Hollow metal frames shall have a minimum of 3 wall anchors and one floor anchor per jamb.

5-5.5.1 **Wood Doors**. Provide flush wood solid core doors complying with National Wood Window and Door Association (NWWDA) I.S.-1A. Stile edges shall be non-finger jointed hardwood compatible with face veneer. Provide American Woodwork Institute (AWI) Grade A hardwood face veneer for transparent finished doors; provide AWI Sound Grade hardwood face veneer for painted doors. Transparent finished doors are preferred.

5-5.5.2 **Hollow Metal Doors**. Comply with ANSI A250.8/SDI 100. Doors shall be Level 2, physical performance Level B, Model 2; top edge closed flush, factory primed. Anchors and accessories shall be zinc coated.

5-5.5.3 **Hollow Metal Frames**. Comply with ANSI A250.8/SDI 100. Frames shall be Level 2, 16 gauge, with continuously welded corners and seamless face joints; factory primed. Anchors and accessories shall be zinc coated. Frames in masonry shall have bituminous back-coating, plaster guards, and shall be grouted solid. All hollow metal doors frames shall be painted (typical).

5-5.5.4 Arms Vault doors and frames needs to meet opening requirements at AR 190-11, Physical Security of Arms, Ammunition, and Explosives. Additional Arms Vault Door and Frame requirements are explained in SOW Ch 5, paragraph 5-7.2 .

5-5.5.5 Telecom Room doors and frames to meet opening requirements for Secret-rated work.

5-5.5.6 **Fire-rated and Smoke Control Doors and Frames**. Comply with International Building Code (IBC), NFPA 80, and requirements of labeling authority. Doors and frames shall bear labels from Underwriters Laboratories (UL), Factory Mutual Engineering and Research (FM) or War. Comply with positive pressure testing requirements of IBC.

5-5.6 **Interior Door Finish Hardware**.

5-5.6.1 **Hinges**. ANSI/BHMA A156.1; template, full mortise; Grade 1, ball bearing on doors with closers; Gade 2, bearing on doors without closers. Minimum 114 mm x 114 mm [4 ½" x 4 ½ "], stainless steel metal.

5-5.6.2 **Locksets for Typical Interior Door**. Provide stand-alone programmable electronic door locksets with audit capabilities. The lockset construction shall be all-metal, heavy-duty, and mortise. The lockset is equipped with hidden mechanical key override, an anti-pick latch and dead bolt, and a magnetic stripe reader complying with ISO standards and ABA dimensional specifications. Each magnetic stripe card will be programmed to gain access into its respective module and sleeping/living rooms. Lockset shall be similar to Kaba Ilco, Solitaire 710-II Series or approved equal. The lockset shall include knob and lever torque test and "Ultra" finish with two-year warranty ANSI/BHMA A156.13; mortise lockset with removable core; non-ferrous base metal.

5-5.6.3 **Locksets for Typical Interior Utility and Maintenance Doors**. spaces with doors covered by this paragraph include: Mechananical Rooms, Electrical Rooms, Telecommunication Rooms, Communication Rooms, Toilets, Janitor and Stairwell. ANSI/BHMA A156.2; series 4000, Grade 1, non-ferrous base metal, removable core.

5-5.6.4 **Exit (Panic) Devices**. ANSI/BHMA 156.3; heavy-duty touch-pad type, through-bolted mounting. Listed and labeled for panic protection based on UL 305. Doors shall be provided with exit device if required by code.

5-5.6.5 **Closers**. ANSI/BHMA A156.4; series C02000, Grade 1, hydraulic, factory-sized, adjustable to meet field conditions. Provide for all entry doors to living units, all doors opening to corridors and as required by codes.

5-5.6.6 **Auxiliary Hardware**. ANSI/BHMA A156.16. Provide wall or floor stops for all doors that do not have overhead holder/stops. Provide other hardware as necessary for a complete installation.

5-5.6.7 **Kick Plates**. ANSI/BHMA A156.6; stainless steel, 254 mm [10"]high x 51 mm [2"] less than door width. Provide at push side of all doors with closers.

5-5.8 **Casework**.

5-5.8.1 **Service Areas in Living Units and Coffee Areas in Admin Areas**.
**Bathroom Vanity in Living Units**
**UEPH Building CQ Station Reception Desk**
**Vanity at Public Toilets**

**The following typical casework description shall apply to the spaces described above:**
Provide architectural cabinetwork complying with AWI Quality Standards, Section 400, Custom Grade cabinets with high-pressure decorative laminate finish, meeting NEMA LD3 standards. Horizontal laminate: nominal .050" thick; vertical laminate: nominal .028" thick. Door and drawer edges shall be plastic laminate: nominal .028" thick. Countertop shall be post-formed high-pressure decorative laminate with waterfall front edge and integral coved backsplash, or solid surfacing material. Cabinets shall be constructed as specified and shall meet requirements of KCMA A161.1. The use of any particle board material for cabinet construction is not permitted.

5-5.8.2 **Other casework**. Provide architectural casework complying with AWI Section 400, Custom Grade cabinets with high-pressure decorative laminate finish meeting NEMA LD3 standards. Horizontal laminate: nominal 1.27mm [.050"] thick; vertical laminate: nominal 0.71mm [.028"] thick. Door and drawer edges shall be plastic laminate: nominal 0.71mm [.028"] thick. Work surfaces and counter shall be high-pressure decorative laminate, or solid surfacing material.

5-5.9 **Window Treatments**. Provide horizontal aluminum mini-blinds at all exterior windows. Blinds shall have one-inch wide by .008-inch thick slats with anti-static, anti-microbial polyester baked enamel finish. Provide heavy duty 25mm x 38mm [1" x 1-1/2"] steel headrail, and tubular steel bottom rail finished to match slats.

5-5.10 **Toilet Partitions**. Toilet partition panels shall be floor supported and reinforced to receive partition-mounted accessories. Finish shall be laminated plastic on solid phenolic core. Toilet partition hardware shall be stainless steel. Latching devices, pulls, and hinges for handicap compartments shall comply with Title III of the American Disability Act and Accessibility Guidelines.

5-5.11 **Elevators**. The offeror shall provide the services of an elevator inspector employed by an independent testing company to inspect the elevator, witness the final testing, and certify elevator. The inspector shall meet all qualification requirements of ASME QEI-1 and shall be certified in accordance with ASME QEI-1. The offeror shall provide an elevator certificate signed by the inspector for each elevator. The certificate shall be provided to the Contracting Officer within 30 days of the completion of testing.

5-5.12 **Sound Attenuation**.

5-5.12.1 **Testing**. Certified proof-of-performance field tests will be conducted to demonstrate that the floor and wall systems as constructed provide the required sound isolation. Tests for air-borne sound shall be made in compliance with ASTM E336. Tests for impact sound shall be made in compliance with ASTM E1007. Testing of 10 percent (minimum) of each type of floor and wall system is required. Location of test sites will be chosen at random by the Contracting Officer.

5-5.12.2 Any wall or floor system found to be inadequate shall have the deficiencies corrected and the additional qualifying tests conducted at the contractor's expense. Testing at the contractor's expense of greater than 10 percent of each system may be required if the Contracting Officer determines that the quality of construction requires this additional testing.

5-5.12.3 Party walls (floor/ceiling construction between different organizational units) shall be designed to provide the minimum airborne sound transmission ratings and impact isolation ratings stated in Table 5-5.12

**TABLE 5-5.12 - SOUND TRANSMISSION STANDARDS FOR PARTY WALL CONSTRUCTION**

| Area | FSTC[1] | FIIC[2] |
|---|---|---|
| Party Walls at UEPH Bldgs. 356 and 358 at all Other Locations | 52 | N/A |
| Party Walls at UEPH Bldgs. 356 and 358 Sleeping/Living Rooms. | 52 | 65 |
| Party Walls at Bldg. 355 and 357 | 52 | 57 |
| Operable partition at Bldg. 357 Classroom/Classroom | 47 | N/A |

Note[1]: Field Sound Transmission Class. See ASTM E336.

Note[2]: Field Impact Isolation Class. See ASTM E1007.

## 5-6 PAINT FINISHES AND COATING

5-6.1 Interior surfaces, except factory pre-finished material, shall be painted a minimum of one prime coat and two finish coat. Baths and laundry rooms, and all their painted trim shall be finish painted with semi-gloss latex. Natural finished interior doors are acceptable. All other areas shall be water-based latex low sheen washable eggshell finish for walls/trims and water-based latex low sheen washable eggshell finish for ceilings. Oil-based paint is not allowed except for surfaces that require special coating. Interior paint finish may be textured. When semi-gloss and low sheen painted surfaces are adjacent to each other, the wall surfaces in the room shall be finished with semi-gloss paint to avoid having two different finishes adjacent to each other.

5-6.2 All exterior surfaces including all utility appendages, shall receive a minimum of one prime coat and two finish coats of paint. Exterior paint shall be water-based latex. Exterior low sheen stains (two coats) will be acceptable, where appropriate for wood. Oil-based paint is not allowed except for surfaces that require special coating.

5-6.3 All painting work conform to and be in compliance with Unified Facilities Guide Specifications, Division 09-FINISHES, Section 09900, Paintings and Coatings.

5-6.4 Paints used on surfaces in areas of high humidity where mildew is possible and on fabric or vapor barrier over insulation shall contain a mildewcide. The mildewcide will not adversely affect the color, texture, or durability of the coating. The mildewcide shall be incorporated into the paint by the manufacturer and shall attain a surface disfigurement rating of 8 or greater when tested in accordance with ASTM D 3273 and evaluated in accordance with ASTM D 3274. Mercurial mildewcide and insecticides shall not be used in paints.

5-6.5 Colors shall be as approved from schemes submitted with proposal. All interior paint surfaces shall be painted off-white. Each proposal shall include three basic exterior and interior color coordinated schemes and color samples. Final selection of exterior colors will be made by the Installation Commander (USAGE-HI). Exterior color selections shall conform to the Installation Exterior Architectural Plan (IEAP).

All exterior wood trim to include framing members around garage door openings shall be “back-primed” (surfaces that will be inaccessible to field painting after installation of the wood trim shall be primed with one coat of primer before installation).

## 5-7 PHYSICAL SECURITY REQUIREMENTS.

5-7.1 **Anti Terrorism / Force Protection**. Designs shall conform to the Department of Defense Minimum Antiterrorism Standards for Buildings, July 31, 2002 listed as Reference 5-2.4. Offerors' proposals will be deemed acceptable provided they comply with the Physical Security Requirements described in paragraphs described below. UEPH buildings are classified as troop billeting structures; COFs, Locker Room Facilities, and Battalion HQs are classified as primary gathering structures

5-7.1.1 The AT/FP standard used to develop the proposed design is the Department of Defense Minimum Antiterrorism Standards for Buildings, July 31, 2002. Agreements regarding definitions include:

5-7.1.2 A perimeter barrier (controlled perimeter) is provided for this project.

5-7.1.3 Minimum Construction Standards based on conventional construction without analysis shall be provided. All minimum standoffs shall be provided according to the Standard.

5-7.1.4 The structure shall have a 33-foot exclusive clear zone.

5-7.1.5 Access to parking within 82 feet of Quad C Buildings will be controlled; defined in UFC 4-010-01, para. B-1.1.2.2.1. Parking along roadways within 82 feet of the buildings will not be allowed, defined in UFC 4-010-01, para. B-1.1.2.2.2.

5-7.1.6 UFC 4-010-01 The preferred location of electrical and mechanical equipment such as transformers, air-cooled condensers, and packaged chillers is outside the unobstructed space or on the roof. However, electrical and mechanical equipment is allowed within the unobstructed space as long as the equipment provides no opportunity for concealment of explosive devices, defined in para. B-1.3.1.

5-7.1.7 The Quad C structures shall be designed to resist progressive collapse since it is 3 stories in height. Progressive Collapse Vulnerability Assessment is attached to this RFP document for offerers' use.

5-7.1.8 Laminated 1/4 inch thick annealed glass is required for all exterior windows and doors, defined in para. B-3.1.1. Window frames shall be provided as defined in para. B-3.1.2.

5-7.1.9 Exterior doors that are not designated as Historic Type (See concept design drawings) are required to be hollow metal door type.

5-7.1.10 A Mass Notification Alert System is required for this project, defined in para. B-4.7

5-7.2 **Arms Vault at Company Operations Facilities**. Physical Security of Arms shall be in compliance with AR 190-11. Refer to SOW Ch 6, para. 6.5.4 for structural Arms Vault requirements. Refer to SOW Ch 2, para. 2-2.2.2 for Arms Vault in Building 355. New floors, walls, and ceilings shall be provided for each Arms Vault. Unless more stringent construction features are required by life safety or building codes, minimum construction requirements shall be as follows:

5-7.2.1 **Floor**. 152 mm [6"] slab on grade; reinforced with minimum 152 mm x 152 mm MW 25.8 x MW 25.8 [6 x 6, W2.4 x W2.4] welded wire fabric, on vapor barrier, on 152 mm [6"] deep porous fill.

5-7.2.2 **Walls**. 206 mm [8"] thick cast-in-place concrete reinforced with 15M [#5] bars at 152 mm [6"] on center, each way, each face. Concrete masonry units reinforced in a similar manner, as described, will be permitted.

5-7.2.3 **Ceiling**. 206 mm [8"] thick cast-in-place concrete reinforced with 15M [#5] bars at 152 mm [6"] on center, each way, each face.

5-7.2.4 **Door and Frame**. Provide 44mm [1-3/4"] thick hollow metal door, industrial type construction,

minimum14 ga. skin plate thickness, and internally reinforced vertically with continuous steel stiffeners spaced 152mm [6”] max. on center. Provide steel bar type, Dutch door style daygate with metal shelf for issuing arms and ammo. Daygate shall have lock operated from outside by key, and from inside by handle. Comply with egress requirements of applicable codes.

Class 5-vault door and frame complying with Federal Specification AA-D-00600C. National Stock Number is 7110009351886; provide pass-thru window in daygate. Locks shall be Underwriters Laboratory listed Group 1 or 1R combination lock.

5-7.2.5 **Penetrations**. Penetrations shall be minimized. All openings or penetrations in Vault floor, walls or ceiling greater than .062 $m^2$ [96 square inches] shall be protected with welded steel rod-and-bar grid weighing 39.6 kg/m2 [8.1 lb./sf], consisting of 25.4 mm x 4.8 mm [1” x 3/16”] vertical bearing bars at 25 mm [1”] on center, and 8 mm [5/16”] diameter horizontal rods at 50 mm [2”] on center; or equivalent protection.

5-7.2.6 **Arms Rack Anchor Rings**. Provide 10 mm [3/8”] diameter stainless steel bar bent into U-shape (25 mm inside radius). Overall length shall be 127 mm [5”]; embed 76 mm [3”] of horizontal legs (open end) in pre-drilled epoxy filled holes. U-shaped end will protrude from floor to provide anchorage for GFGI arms racks. Orient the projecting U-shape vertically. Provide anchor rings at 3’-0” on center along the floor inside the Arms Vault -Verify with DPW for exact installation and mounting location.

5-7.2.7 **Floor Anchors for GFGI Security Safes**. Provide 10 mm [3/8”] diameter stainless steel bar bent into U-shape (25 mm inside radius) with 2” long 90 degree returns at ends of vertical legs. Overall height shall be 127 mm [5”]; embed 76 mm [3”] of vertical legs (open end) in concrete floor slab; 51 mm [2”] of U-shaped end will protrude above slab to provide anchorage for GFGI security safe.

**5-8 SIGNAGE**

5-8.1 **Directional, Informational, and Motivational Signage**. Signs consist of exterior building signage, interior signage, Interior building directories, directional signs, and identification signs. All Exterior and Interior Signage shall comply with TM 5-807-10. Coordinate with installation facilities engineer (DPW) for location of all signs, color of sign, and verbiage to be included on all signs. All exterior signs and interior Building Directory Signs shall be constructed of minimum 0.090-inch think aluminum sheets. All other signs shall be constructed of minimum 4.76 mm [3/16-inch] thick plastic acrylic sheets. All signage shall comply with requirements of ADAAG and UFAS. Refer to Attachment No. 1 for Sign Types described below.

5-8.2 **Exterior Signs:** provide the following Exterior Building Sign Types:

5-8.2.1 Provide a total of four Exterior Building Identification Signs, one per building, Type D4, Sign grid 1, size: 762 mm H x 1067 mm W [30”H x 42”W].

5-8.2.2 Provide a total of eight Exterior Building Number Signs, two per building, Type C8, wall mounted, Sign grid 1, size: 457 mm H x 1372 mm W [18”H x 54”W].

5-8.2.3 Provide all exterior doors with Room Identification Sign, Type BB2, wall mounted, size: 229 mm H x 229 mm W [9”H x 9”W].

5-8.2.4 Provide a total of 12 Exterior Guide Signs, Type AA5, wall mounted, size: 3 modules of 70 mm H x 457 mm [W 2-3/4”H x 18”W].

5-8.2.5 Provide a total of 12 Exterior Guide Signs, Type AA6, ceiling mounted, size: 3 modules of 102 mm H x 610 mm W [4”H x 24”W].

5-8.2.6 Provide a total of 15 Company Identification Sign, Type BB2 (similar), wall mounted, size: 305 mm H x 610 mm W [12”H x 24”W]. Text Size=1” Cap with ½” line spacing vertically in lieu of 3/8”.

5-8.3 **Interior Signs**: provide the following Interior Building Sign Types:

5-8.3.1 Provide eight Building Directory Signs, two per building, Type AA1, wall mounted, Sign grid 2, size: 1067 mm H x 1219 mm [42”H x 48”W].
5-8.3.2 Provide all interior doors with Room Identification Sign, Type BB2, wall mounted, size: 229 mm H x 229 mm] 9”H x 9”W].

5-8.4 See accessibility section for accessible signage requirements.

## 5-9 ACCESSIBILITY FOR HANDICAPPED (PHYSICALLY IMPAIRED) PERSONS, BARRIER FREE DESIGN.

5-9.1 Accessibility will be based on requirements of the Americans with Disabilities Act (ADA.) Public accommodation will be provided as described in the ADA Architectural Guidelines (ADAAG.). Refer to SOW Chapter 2 for ADA requirements for individual spaces.

5-9.2 Proposed accommodations generally consist of the following:

5-9.2.1 Public areas will be ADA-compliant.
5-9.2.2 Entries and exits accessible as required by ADA.
5-9.2.3 An accessible path to all offices will be provided.
5-9.2.4 Toilets Rooms to be ADA-compliant.
5-9.2.5 All common use areas will be ADA-compliant.
5-9.2.6 ADA-compliant directional and identification signage will be provided.
5-9.2.7 All employee-only spaces will be provided with ADA-compliant approach, entry, turn-around and exit.
5-9.2.8 Where disabled employees presently exist, provide path and floor area space suitable for accommodation should be provided. No disabled employees have been identified.
5-9.2.9 ADA-compliant fire alarm systems are described in the Fire Protection Design Analysis.
5-9.2.10 ADA-compliant communication systems are described in the Electrical Design Analysis.

# CHAPTER 6

## STRUCTURAL DESIGN

6-1 **GENERAL**. The structural criteria established herein shall be used for structural loading, design and installation of all structural systems and foundations, including manufacturing, erection, supervision, testing, and quality assurance of the completed installation of the buildings. A concept structural design which includes seismic and antiterrorism/force protection design has been prepared by the Government and is an attachment to this RPF. The offerors shall incorporate the concept structural design into their design proposal, however the concept design may be changed due to innovation or economic efficiency, not withstanding requirements of all other sections of this rfp and provided all structural criteria herein are met and accounted for in a rational analysis and stamped by a structural engineer licensed in the U.S. The winning offeror shall provide final structural design in compliance with the structural design criteria listed below.

6-2 **DESIGN CRITERIA**. Structural design criteria and guidance are contained in the following documents. Editions that are current at the date of issue of the RFP shall apply.

6-2.1. TI 800-01, Design Criteria
6-2.2. TI 809-04, Seismic Design for Buildings
6-2.3. TI 809-05, Seismic Evaluation and Rehabilitation for Buildings
6-2.4. TM 5-853-1, Security Engineering, Vols 1-3 (For Official Use Only)
6-2.5. MIL HNDBK 1013/1A, Design Guidelines for Physical Security of Facilities
6-2.6. AR 190-11, Physical Security of Arms, Ammunition, and Explosives, with Change 1
6-2.7. ASCE 7, Minimum Design Loads for Buildings and Other Structures
6-2.8. Unified Facilities Guide Specifications (UFGS)
6-2.9. EM 1110-2-2002, Evaluation and Repair of Concrete Structures
6-2.10. UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings, 31 Jul, 2002
6-2.11. UFC 1-200-01, Design: General Building Requirements, dated 31 July 2003
6-2.12. 2000 International Building Code (IBC 2000)

6-3 **MINIMUM LOAD STANDARDS.** Design loads and load combinations shall be in accordance with 2000 IBC, except as otherwise indicated by this chapter. Additional seismic and anti-terrorism requirements are covered under criteria listed in paragraphs that follow. Design loads shall meet the minimum load standards shown in Table 6-1.

TABLE 6-1 - MINIMUM LOAD STANDARDS

| LOAD TYPE | REQUIREMENT |
|---|---|
| Dead Load | Actual |
| Roof Live Load | 1 kPA (20 psf) |
| Balconies, First Floor Corridor, Stair, Dining & Serving Room | 4.8 kPa (100 psf) |
| Corridor above first floor | 3.8 kPa (80 psf) |
| Dining and Serving Room | 4.8 kPa (100 psf) |
| Kitchen and Dishwashing Room | 12 kPa (150 psf) |
| Residential Live Load | 1.9 kPa (40 psf) |
| Classroom Live Load | 1.9 kPa (40 psf) |

| | |
|---|---|
| Office and Restroom Live Load | 2.4 kPa (50 psf) |
| Light Storage Live Load | 3.5 kPa (70 psf) |
| Stair and Exitways | 4.8 kPa (100 psf) |
| Mechanical and Electrical Room Live Load | 7.2 kPa (150 psf) |
| Wind Load Criteria | 105 MPH Basic Wind Speed Exposure "C" in accordance with ASCE 7 |
| Seismic Load Criteria | Refer to Seismic Evaluation and Rehabilitation Report |

6-4 **MINIMUM MATERIAL STRENGTHS AND PROPERTIES.**

6-4.1 **Foundation**. Foundation shall be concrete footings and/or thickened slab edges compatible with the soil and climatic conditions of the site. Allowable soil bearing pressure shall be 3000 psf for footings bearing on undisturbed residual soil.

6-4.2 **Reinforced Concrete**. Concrete Requirements. All concrete shall conform to IBC 2000.

6-4.2.1 Minimum concrete strength at 28 days: 21 Mpa (3000 psi) with water-cement ratio not more than 0.45.

6-4.2.2 Minimum concrete thickness:

Slab-on-grade: Non-structural interior slab-on-grade design shall be in accordance with TI 809-02. Non-structural interior slab-on-grade system shall consist of minimum 102 mm (4") concrete slab over vapor barrier over granular termite barrier over separation geotextile over capillary water barrier. Welded wire reinforcement shall be secured at mid-depth of slab by mechanical means such as precast concrete spacers or reinforcing chairs. All slabs-on-grade shall be moist cured for a minimum of 7 days followed by curing by curing compound for another 3 weeks. Curing compound shall be dissipating type compatible with any floor seal or floor covering adhesive.

Structural members. The thickness of all structural members shall conform to ACI 318, Building Code Requirements for Reinforced Concrete.

6-4.2.3 The minimum yield strength Fy of reinforcing steel shall be 275 Mpa (40,000 psi).

6-4.3 **Concrete Masonry Units (CMU).**

6-4.3.1 Reinforced masonry assemblies shall have a minimum compressive strength of 10.34 Mpa (1500 psi).

6-4.3.2 Cmu shall conform to ASTM C 90, Type II, except oven-dry weight shall be no less than 581 kg per cubic meter (119 pcf) for hollow load bearing units.

6-4.3.3 Mortar shall be Type "S" conforming to ASTM C 270.

6-4.3.4 Grout shall conform to ASTM C 476 with a minimum compressive strength of 15 Mpa (2000 psi).

6-4.4 **Structural Steel.**

6-4.4.1 Structural steel shall conform to ASTM A 36 or better.

6-4.4.2 Anchor bolts shall conform to ASTM A 307. Machine bolts shall conform to ASTM A 325.

6-4.4.3 All welds shall be accomplished by certified welders in conformance with AWS D1.1, Structural Welding Code.

6-4.4.4 All steel shall be primed in the shop. Exposed steel shall be hot-dip galvanized.

6-4.5 **Light Gage (Cold-Formed) Steel Construction.** Design and construction shall be in accordance with IBC 2000.

6-4.5.1 Fasteners. All screws, bolts, anchor bolts and expansion shields shall be stainless steel or finished with zinc, cadmium or co-polymer coatings. Pneumatically driven pins or nails will not be permitted. All welded connections shall be designed in accordance with Section E of the AISI Specification. All welding shall be accomplished in accordance with AWS D1.3 standards. All weld areas shall be re-touched with the appropriate paint or cold galvanized to retain corrosion resistance.

6-4.5.2 Protective Coating. Exposed light gage steel members will not be allowed. All light gage steel used for exterior applications shall have minimum G-90 hot dip zinc coating in accordance with ASTM A 525. Exterior applications include all steel members directly supporting exterior siding or roof sheathing. Interior applications shall have a minimum G-60 hot dip zinc coating in accordance with ASTM A 525.

6-4.6 **Miscellaneous Metal Items.** All railings, handrails, anchor bolts, plates, and steel embedded in concrete, metal studs and runners, and other miscellaneous metal items shall be galvanized. All damaged galvanized areas not embedded shall be repaired with galvanizing repair compound. All metal items listed above that are exposed to the weather or exterior shall be hot-dip galvanized or coated with inorganic zinc primer.

6-4.7 **Structural Wood.**

6-4.7.1 Wood structural members are not allowed.

6-5 **SPECIAL REQUIREMENTS**.

6-5.1 **AISC Certification requirements**: All fabrication of structural steel shall be accomplished by an AISC certified Category Sbd fabricating plant.

6-5.2 **Materials Testing.** As a minimum, the following concrete tests shall be performed: air content, slump, unit weight, temperature, and strength. Refer to United Facilities Guide Specification Section 03300, Cast-in-Place Structural Concrete, for sampling and testing standards. All costs for testing shall be borne by the Contractor.

6-5.3 **Special Inspection.** Continuous or periodic special inspection by a certified inspector shall be performed on seismic-resisting systems in accordance with IBC 2000, Section 1704. See also Unified Facilities Guide Specification Section 01452, Special Inspection for Seismic-Resisting Systems, for inspection requirements and other details.

6-5.4 **Arms Vaults.** The arms vault in each Company Operations Facility shall meet the requirements

of AR 190-11. Refer also to paragraph 5-7.2.6, “Arms Rack Anchor Rings”.

6-5.5 **Antiterrorism/Force Protection (AT/FP).** This project is classified as a major renovation for inhabited structures of troop billeting and primary gathering structures which shall be designed and constructed to meet DOD AT/FP design criteria, UFC 4-010-01, DOD Minimum Antiterrorism Standards for Buildings, 31 Jul, 2002.

The Government has prepared a concept site plan which employs operational options for parking areas and roadways to meet all AT/FP standoff distance requirements of UFC 4-010-01 and to obviate the need to harden the existing Quad C buildings for anti-terrorism blast loads. Refer to Statement of Work, Chapter 3, Paragraph 3-5, Site Development Plan, for AT/FP operational options in the site concept design.

The Government has also prepared an independent anti-terrorism/force protection assessment and retrofit (AT/FP concept design) report, entitled “Progressive Collapse Vulnerability Assessment”, by Mitsunaga and Associates, dated May 2003 (attached) to provide compliance to other AT/FP requirements of UFC 4-010-01.

New windows shall meet requirements of UFC 4-010-01, paragraph B-3.1 as indicated by the AT/FP concept design. Window criteria include minimum ¼” nominal laminated glass for all exterior windows and glazed doors with 3/8” minimum frame bite for structural glazed windows and 1” bite for window systems that are not structurally glazed.

The requirement to design and retrofit existing floor slabs (with FRP or similar top slab reinforcing) to withstand upward blast loads as given by paragraph B-2.1.3 of UFC 4-010-01 shall be treated as a bid option to this project since this floor slab requirement is not required in accordance with the interim 1999 AT/FP standards.

The offerors shall incorporate all AT/FP concept design report and the Site Development Plan (paragraph 3-5) into their design proposal submissions and shall include associated retrofit costs in their price proposal submissions. The AT/FP concept design and the Site Development Plan (paragraph 3-5) shall be the basis for final design and actual construction. The AT/FP concept design retrofit upgrades shall be integrated with the seismic rehabilitation plan described in the following paragraph, so that strengthened/new structural members may serve dual functions. Anti-terrorism/force protection design shall be comply with the statement of work chapters on Historical Preservation.

6-5.6 **Seismic Evaluation and Rehabilitation.** Army regulations require that the buildings of Quad C be evaluated to determine possible requirements for structural rehabilitation to mitigate seismic hazards. The Government has prepared an independent seismic evaluation and rehabilitation (concept seismic design) report to minimize risks to offerors due to unknown conditions. The seismic concept design report entitled, “Seismic Evaluation and Rehabilitation Report, by Mitsunaga and associates, Inc, dated May 2003 is attached to this RFP. The offerors shall incorporate the seismic concept design into their design proposal submissions, and include seismic rehabilitation costs in their price proposal submissions. To give the offeror the opportunity for design innovation and economy, the design proposal need not follow the concept design exactly, provided the seismic forces specified in the report are accounted for in a rational analysis developed by a licensed structural engineer, and load path requirements are met. The seismic design criteria for the seismic concept design include TI 809-05, Seismic Evaluation and Rehabilitation for Buildings, and TI 809-04, Seismic Design of Buildings. The winning offeror shall incorporate the newer seismic design criteria listed in paragraph 6-2, Design Criteria (IBC 2000 as amended by UFC 1-200-01) as a basis for their final seismic design.

As stated in the previous paragraph, requirements for seismic rehabilitation shall be integrated with AT/FP

retrofit requirements.

6-5.7. **Concrete Damage Repair.** No major concrete repairs are anticipated. Miscellaneous spalling and cracking shall be repaired following methods prescribed in EM 1110-2-2002, Evaluation and Repair of Concrete Structures.

6-5.8 **Existing and New Structural Systems.** Existing structural systems shall be analyzed and retrofitted to insure new live loads provided in section 6-2 (including IBC 2000 and/or Table 6-1) can be supported. New live loads shall include new cooling tower, machine rooms and arms rooms.

# CHAPTER 7

## THERMAL PERFORMANCE

7-1 **THERMAL CHARACTERISTICS**. Building construction shall conform to the current version of ASHRAE 90.1. All buildings shall be classified as non-residential. R and U values shall be calculated in accordance with ASHRAE methods.

7-2 **THERMAL INSULATION**.

Characteristics. Thermal insulation shall have a flame-spread rating of 25 or less and a smoke-development rating of 50 or less, exclusive of the vapor barrier, when tested in accordance with ASTM E84. A vapor barrier shall be provided on the warm-in-winter side of exterior wall and ceiling insulation. Polyurethane is allowed as an insulation material for slabs and outside concrete or unit masonry walls. It is prohibited as an injected insulation material in walls or floor cavities or within the building envelope.

7-3 **INFILTRATION**. To limit air infiltration, buildings will be sealed with an air infiltration barrier, installed in accordance with the manufacturer's recommendations. The building envelope shall be caulked, gasketed, weatherstripped or otherwise sealed: around window and door frames, between wall cavities and frames, between walls and ceiling and roof, between walls and floors, at access doors and panels, at utility penetrations through walls, floors, and roofs, and at any other exterior envelope joint which may be a source of air leakage. These steps shall constitute tight building construction.

# CHAPTER 8

# PLUMBING

## 8-1 GENERAL REQUIREMENTS

8-1.1 **Plumbing scope**. The plumbing requirements for the project, as indicated in this Chapter, are generally contained within this chapter unless otherwise noted. Other plumbing scope indicated by other Chapters and the Attached Concept Design Documents (Drawings, Plumbing Calculations), which are to be used for the design of this project, are subject to requirements in this section. All requirements within this Chapter shall take precedence over any conflicting requirement in other Chapters, Attachment Concept Design Documents or any other criteria and shall be brought to the attention of the Contracting Officer for resolution in writing. All definitions and acronyms used in this section are intended to be used for this section only unless otherwise noted. Catalog cuts in the attachments are not intended to be exact equipment provided. Equipment shall be similar to catalog cuts and based on design developed after award.

8-1.2 **Design Standards and Codes**. Plumbing system shall be designed and installed in accordance with the latest edition of the International Plumbing Code (IPC) and the references listed below. Inspection and testing of the plumbing system shall be performed as prescribed in the IPC. Specified materials and equipment shall be standard products of a manufacturer regularly engaged in the manufacturer of such products. Specified equipment shall essentially duplicate equipment that has performed satisfactorily at lease two years prior to bid opening. System design and installation must conform to the following mandatory energy and water conservation criteria.

| | |
|---|---|
| Code of Federal Regulations<br>Government Printing Office<br>Washington, DC 20402 | 10 CFR 434<br>Energy Conservation Program for Consumer Products |
| NON-GOVERNMENT PUBLICATIONS | |
| Air Conditioning and Refrigeration Institute (ARI) | ARI 1010 (1994) Self-Contained, Mechanically Refrigerated Drinking-Water Coolers |
| American Society of Mechanical Engineers International<br>Three Park Place<br>New York, NY 10016-5990 | ASME A112.19.1 (1994; R1999) Enameled Cast Iron Plumbing Fixtures<br>ASME A112.19.2 (1998) Vitreous China Plumbing Fixtures<br>ASME A112.19.3 (1987; R 1996) Stainless Steel Plumbing fixtures (Designed for Residential Use)<br>ASME A112.19.4 (1994; Errata Nov 1996) Porcelain Enameled Formed Steel Plumbing Fixtures<br>ASME B16.22 (1995; B16.22a 1998) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings<br>ASME B16.18 (1984; R 1994) Cast Copper Alloy Solder Joint Pressure Fittings |

| | |
|---|---|
| American Society of Heating, Refrigerating and Air Conditioning Engineers<br><br>1791 Tully Circle. NE<br>Atlanta, GA 30329-2305 | ASHRAE 90.1 (1989; 90.1b; 90.1c; 90.1d; 90.1e; 90.1g; 90.1i 90.11-1995; 90.1m-1995; 90.1n-1997)<br>Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings<br><br>ASHRAE Hdbk-IP (1999)<br>Handbook, Application I-P Edition |
| Cast Iron Soil Pipe Institute | CISPI 301 (1997) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications<br><br>CISPI 310 (1997) Coupling for Use in Connection With Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping<br><br>CISPI HSN-85 (1985) Neoprene Rubber Gaskets for Hub and Spigot Cast Iron Soil Pipe and Fittings. |
| Department of the Army<br>U.S. Army Corps of Engineers<br>Washington, DC 20314-1000 | ETL 1110-3-489, Engineering and Design, Domestic Water Heaters for Barracks, 3 April 1998. |
| International Association of Plumbing and Mechanical Officials<br><br>20001 Walnut Drive South<br>Walnut, CA 91789-2825 | IAPMO Z124.1 (1995) Plastic Bathtub Units<br><br>IAPMO Z124.3 (1995) Plastic Lavatories<br><br>IAPMO Z124.5 (1997) Plastic Toilet (Water Closets) Seats<br><br>IAPMO Z124.9 (1994) Plastic Urinal Fixtures |
| International Code Council, Inc.<br><br>5203 Leesburg Pike, Suite 708<br>Falls Church, VA 22041-3401 | International Plumbing Code (2000) |
| Unified Facilities Guide Specification (UFGS) | Section 02556, Gas Distribution System, December 2002<br><br>Section 13080, Seismic Protection for Miscellaneous Equipment, April 1999<br><br>Section 15070A, Seismic Protection for Mechanical Equipment, January 2002<br><br>Section 15080A, Thermal Insulation for Mechanical Systems, July 2002<br><br>Section 15190A, Gas Piping Systems, March 2003<br><br>Section 15400A, Plumbing, General Purpose, May 2003 |

**8-2 APPENDIX AND RECOMMENDATIONS.** Plumbing design criteria in general that are stated in any reference, which are either in the appendix, stated as a recommendation or addressed with a “should” shall be considered to be mandatory requirements and will be incorporated into the design.

## 8-3 DESIGN CALCULATIONS

8-3.1 **Hot water heater calculations**. Design shall be based on the methods described in ASHRAE 1999 Applications Handbook. Use calculations in the attachments for determining storage capacity and recovery rate. Hot water shall be stored at 60 deg. C (140 deg. F) and tempered to provide hot water to the hand sinks and lavatories in the employee toilets at 43 deg. C (110 deg. F). 60 deg. C (140 deg. F) hot water shall be supplied to food preparation sinks, vegetable preparation sink and the pot and pan sink. 82.2 deg (180 deg. F) hot water will be provided to the dishwashers, pot and pan rinse sink and hose bibb at the field feeding equipment room. An electric water heater shall be provided at each location to boost the temperature from 60 deg. C (140 deg. F) to 82.2 deg. C (180 deg. F). Provide a hot water recirculation pump if hot water piping extends further than 15.2 meters (50 feet). Hot water heater and storage systems for the barracks occupancies shall be sized in accordance with ETL 1110-3-489. The hot water and storage systems for the barracks occupancies shall be added to the other hot water demands, including, but not limited to, clothes washers and kitchen areas, to obtain the total hot water demand and storage required.

8-3.2 **Piping.** Design shall be based on the IPC for domestic water, sanitary waste and vent piping. All water piping shall be sized in accordance with methods outlined in the IPC, to limit water velocity to 2440 mm/sec (8 ft/sec) unless a lower velocity is recommended by the plumbing fixture manufacturer(s).

## 8-4 EQUIPMENT

8-4.1 **Water Heater.** Water heater types and capacities shall be as indicated in the Attached Concept Design Documents (Drawings, Plumbing Calculations) and shall conform to the requirements in UFGS. Water heaters shall be sized in accordance with paragraph 8.3.1 for a 32 deg. C (90 deg. F) rise. Water heater energy factors shall meet or exceed the minimum requirements of 10 CFR Part 434 and shall be Energy Star or with efficiencies in the upper 25% of what is available.

8-4.2 **Storage Tanks.** Hot water storage tanks shall be of type and capacity as indicated in the Attached Concept Design Documents (Drawings, Plumbing Calculations) and shall conform to the requirements in UFGS. Storage tanks shall be the construction of one manufacturer, AMSE stamped for the working pressure, and shall have the National Board (ASME) registration. The tank shall be cement-lined or glass-lines steel type in accordance with AWWA D100. Tanks shall be equipped with a pressure gauge and thermometer, 155 mm (6 inch) minimum diameter face.

8-4.3 **Circulation Pumps.** Hot water circulation pumps shall be of type and capacity as indicated in the Attached Concept Design Documents (Drawings, Plumbing Calculations) and shall conform to the requirements in UFGS. Pump motors shall be non-overloading at any point on the pump curve. Pump and motor shall be standard mechanically coupled. C-face motors shall not be allowed. Pumps shall be mounted concrete housekeeping pads. Pumps shall be equipped with a pressure gauge 155 mm (6 inch) minimum diameter face on the inlet and discharge of each pump. Pumps shall be provided whenever hot water piping extends further than 50 feet from a tank.

8-4.4 **Booster Pumps.** Variable speed pumping system shall provide a minimum of 413.7 kPa (60 psi) by varying speed and number of operating pumps. The factory prepiped and prewired assembly shall be mounted on a steel skid frame complete with pumps, variable speed drives, motors, and controls. The variable speed drives shall be the oil-filled type capable of power transmission throughout their complete speed range without vibration, noise or shock loading. Each variable speed drive shall be run-tested by the manufacturer for rated performance, and the manufacturer shall furnish written performance certification. System shall have suppressors to prevent noise transmission over electric feed lines. Required electrical control circuitry and system function sensors shall be supplied by the variable speed drive manufacturer. The primary power controls and magnetic motor controllers shall be installed in the controls supplied by the drive manufacturer. The sensors shall be located in the system to control drive speed as a function of constant pump discharge pressure. Connection between the sensors and the variable speed drive controls

shall be accomplished with copper wiring. Controls shall be in NEMA 250, Type 1 enclosures.

8-4.5 **Factory authorized supplier.** The equipment shall be furnished by a factory authorized supplier within a distance of 500 miles of the installation site.

**8-5 FIXTURES.** The following fixtures will be acceptable for the facilities on this project except where noted otherwise for specific buildings. Where indicated, fixtures shall be handicap accessible type in accordance by ADAAG. Fixtures shall be water conservation type, in accordance with the IPC. Fixtures shall be provided complete with fittings and chromium- or nickel-plated brass (polished bright or satin surface) trim. All fixtures, fittings and trim in the project shall have the same finish.

8-5.1 **Requirements.** Vitreous china plumbing fixtures shall conform to ASME A112.19.2, Vitreous China Plumbing Fixtures. Stainless steel fixtures shall be in accordance with ASME A112.19.3, Stainless Steel Plumbing fixtures (residential design). Plastic fixtures shall conform to IAPMO Z124. Enameled cast iron plumbing fixtures shall comply with ASME A112.19.1, and enameled steel fixtures shall comply with AMSE A112.19.4.

8-5.2 **Traps.** Exposed traps shall be chromium-plated, adjustable-bent tube, 20-gauge brass. Concealed traps may be plastic (ABS).

8-5.3 **Faucets.** Faucets, other than faucets provided for the dining facility, shall be single-control type, with seals and seats combined in one replaceable cartridge designed to be interchangeable among lavatories and kitchen sinks, or having replaceable seals and seats removable either as a seat insert or as part of a replaceable valve unit. Water flow shall be no more than 0.158 L/s (2.5 GPM) from any faucet.

8-5.4 **Showers.** Showers shall be equipped with a combination valve and flow control device to limit the flow to 0.158 L/s (2.5 GPM) at pressures between 137.9 to 413.7 kPa (20 and 60 psi).

8-5.5 **Water closets.** Water closets shall have elongated bowl with flush tank, floor outlet with wax gasket and open-front seat. An adequate quantity of water shall be provided to flush and clean the fixture served. The water supply to flush tanks equipped for manual flushing shall be controlled by a float valve or other automatic device designed to refill the tank after each discharge, and to completely shut off the water flow to the tank when the tank is filled to operational capacity. Water closets having their flush valve seat located below the flood level rim of the closet bowl shall have a ballcock installed within a sheath or in a separate and isolated compartment of the tank, both to have visible discharge onto the floor in case of failure. Provision shall be made to automatically supply water to the fixture so as to refill the trap seal after each flushing.

8-5.6 **Urinals.** Urinals shall be flush valve, wall mounted type and shall meet the requirements of the code.

8-5.7 **Lavatories.** Lavatories shall be rectangular type, minimum 508 by 457 mm (20 by 18 inches). Lavatories shall be vitreous china or cast iron, self-rimming or wall hung type. Lavatories shall be furnished with hot and cold water and have pop-up drains. Lavatories shall meet the requirements of the code.

8-5.8 **Showers.** Shower stalls shall be of ceramic tile, floor to ceiling, over membrane waterproofing on a cementitious substrate; or gel-coated, glass-fiber reinforced polyester. Shower receptors shall be slip resistant cast stone. Shower stall wainscots shall be ceramic tile.

8-5.9 **Kitchen sinks.** Kitchen sinks, other than sinks provided for the dining facility, shall be Type 302 stainless steel, 20-gauge minimum, seamless drawn and sound deadened. Sinks shall be single or multiple bowl with self-rimming, complete with cup strainer and plug. Kitchen sinks shall meet the requirements of the code. Kitchen sinks shall be provided with a garbage disposer. Garbage disposer shall have a minimum capacity of 0.75 kW (1 HP), 1.48 L (50 oz.) grind chamber, stainless steel grind chamber

and grind elements, corrosion protection shield and two-way grinding action.

8-5.10 **Service sinks.** Service sinks shall meet the requirements of the code.

8-5.11 **Electric water coolers.** Units shall be electric refrigerated type and shall conform to the requirements of ARI 1010 and the Lead Contamination Control Act of 1988.

8-5.12 **Handwash sink.** For the handwash area, provide 2 each, 4 station wall mounted wash sink of stainless steel construction, cold water only.

**8-6 PIPING SYSTEMS.** Piping shall be concealed. Individual shutoff or stop valves shall be provided on water supply lines to each plumbing fixture, piece of equipment except showers and on takeoffs from risers to each floor. Shutoff valves shall be provided for each bathroom group. Pipe and fittings shall be as follows:

8-6.1 **Water piping.** System design, component selection and system installation, including pressure containing parts and material, shall be based upon a minimum service pressure of 862 kPa at 66 degrees C (125 psi at 150 degrees F); minimum ANSI Class 125.

8-6.1.1 Cold water aboveground. Water piping above grade shall be hard-drawn copper tubing, Type K or Type L.

8-6.1.2 Hot water aboveground. Water piping above grade shall be hard-drawn copper tubing, Type K or Type L.

8-6.1.3 Cold water below ground. Water piping below ground shall be in accordance with Chapter 4 Site Engineering.

8-6.1.4 Hot water below ground. Provide prefabricated insulated pipe and fittings. Foam insulation for prefabricated insulated pipe and fittings shall be polyurethane foam meeting the requirements of ASTM C 591 having a density of not less than 32 kg per cubic meter (2 pcf). Carrier pipe shall be in accordance with Chapter 4 Site Engineering.

8-6.1.5 Fittings for soft copper tubing shall conform to ASME B16.18 and for hard-drawn to ASME B16.22.

8-6.2 **DWV piping.** Soil, waste, vent and drain piping shall be service weight cast iron pipe except for piping serving beverage areas in the dining facility. Provide high silicon content cast iron pipe and fittings, for beverage areas.

8-6.2.1 Underground piping and fittings shall be hub pipe, ASTM A 74.

8-6.2.2 Aboveground piping and fittings shall be no-hub, CISPI 301 and ASTM A 888, or hub pipe, ASTM A 74.

8-6.2.3 Provide high silicon content cast iron pipe and fittings, ASTM A518A and ASTM A518M, on branch lines from beverage areas and other areas handling carbonic acid to the building sewer drain line. Provide sufficient high silicon content cast iron pipe so that carbonic acid waste can be diluted by the other building waste as to prevent corrosion of the piping.

8-6.2.4 A waiver from TI 800-01, Appendix C, paragraph 19b to allow sanitary sewer lines above the dining facility in Quad C has been granted by HQ USACE as long as the following requirements are met:

1. All openings through floors over the dining facility shall be provided with sleeves securely

bonded to the floor construction and projecting not less than 3/4 inch above the top of the finished floor with space between sleeve and pipe or duct sealed.

2. Floor and shower drains installed over the dining facility shall be equipped with integral seepage pans.

3. Floor and shower drains installed above the dining facility shall be of the wall mounted type except bathtubs. Tubs shall have waste and overflow connections made above the floor piped to the trap below the floor. Connections through floors and traps shall conform with the International Plumbing Code. No floor openings, other than sleeve for waste pipe, will be permitted for tubs.

4. All other soil or drain pipes shall be as indicated in this statement of work. Cleanouts shall be extended through the floor construction above.

5. Soil and drain pipes located above the dining facility shall be subjected to a standing water test of not less than 25 feet.

6. Piping subject to operation at temperatures that will form condensation on the exterior of the pipe shall be thermally insulated.

7. Where pipes are installed in ceilings above the dining facility, the ceiling shall be of the removable type, or shall be provided with access panels in order to form a ready access for inspection of piping.

8-6.3 **Gas piping.**

8-6.3.1 Underground gas piping shall be polyethylene pipe, ASTM D 3350 and ASTM D 2513, or fiberglass pipe, ASTM D 2517, and be installed in accordance with UFGS.

8-6.3.2 Aboveground gas piping shall be seamless galvanized steel pipe, ASTM A53, Type S, Grade B, and be installed in accordance with UFGS.

**8-7 MISCELLANEOUS ITEMS**

8-7.1 **Cleanouts.** Cleanouts shall be provided at each change in direction of sanitary sewer lines, at the intervals specified in the NSPC and at the building service entrance. All cleanouts shall be permanently accessible. Cleanouts-to-grade shall be installed in a 305 by 305 mm (12 by 12 inch) concrete pad, flush with grade. Wall and floor types shall be provided as required by the code. Access panels or cover plates shall be provided in exposed areas.

8-7.2 **Hose bibbs.** Hose bibbs shall be provided at each exterior face of the building and shall be no more than 30 meters (100 feet) apart. Hose bibbs shall be supplied with an integral vacuum breaker.

8-7.3 **Backflow preventers.** Backflow preventers shall be provided as required by the code.

8-7.4 **Grease Traps.** Grease interceptor shall be pre-cast concrete, HS20 vehicular traffic rated, complete with cast iron manhole frames and airtight covers. Grease interceptor shall meet or exceed ASTM C 1227-02b. Manholes shall be a minimum of 609 mm (24 inches) in diameter. All waste from the first floor of Building 357, except from toilet areas, shall be piped to grease traps.

**8-8 PIPE INSULATION.** Minimum insulation thicknesses and performance shall be in accordance with UFGS.

8-8.1 **Domestic service hot water piping.** Aboveground domestic service hot water pipe mains and laterals shall be insulated with rigid fiberglass type insulation in accordance with UFGS. Below grade domestic service hot water pipe mains and laterals which are not prefabricated, insulated pipe, shall be insulated with cellular glass type insulation in accordance with UFGS. Hot water drops to fixtures located in walls are not required to be insulated.

8-8.2 **Equipment.**

8-8.2.1 Hot water storage tanks. Hot water storage tanks shall be insulated with cellular glass type insulation in accordance with UFGS.

8-8.2.2 Hot water circulation pumps. Hot water circulation pumps shall be insulated with cellular glass type insulation in accordance with UFGS.

# CHAPTER 9

# ELECTRICAL SYSTEMS

## 9-1. BUILDING ELECTRICAL SYSTEM

9-1.1. **Conformance to Code**: The electrical system shall be designed in compliance with the rules and recommendations of ANSI C2, National Electrical Safety Code (NESC) 2002 edition, NFPA 70, National Electrical Code (NEC) 2002 edition, UFC 3-520-01 Interior Electrical Systems, TM 5-811-1 Electrical Power Supply Distribution, TI 800-01 Design Criteria, and TI 811-16 Lighting Design.

9-1.2. **Electrical Service**: Electrical system characteristics for building services shall be 277/480 volts, three-phase, 4-wire, 60 Hertz, grounded neutral.

9-1.3. **Capacities**: Dwelling unit cooktops, range hoods, and garbage disposers are part of Option Number 2. If Option Number 2 is not awarded, cooktops, range hoods, and garbage disposers will be installed at a later date. Therefore, the proposer shall size electrical work to include cooktops, range hoods, and garbage disposers, including but not limited to overcurrent protection, transformers, electrical services, feeders, panelboards and loadcenters, etc.

9-1.4. **Emergency Power**: The dining facility electrical system shall include provisions for connecting a Government Furnished, Government Installed portable generator to power critical dining facility loads (code required emergency systems, refrigeration units, igniter circuits for gas cooking appliances, cooking exhaust systems, limited lighting, etc.) during power outages. Coordinate portable generator requirements with the DPW.

9-1.5. **Late Turn-Over**: Building 355 will not be turned over to the Contractor for construction with the balance of the project. Instead, this building will remain occupied and in service during the beginning of the construction period. Turn over date for this building is indicated elsewhere in these specifications. The Contractor is responsible to retain electrical services (power, telephone, signals, etc.) to this building until it is turned over to him for construction. This building must remain accessible to military personnel and the public until it is turned over for construction. In addition base personnel and various contractors must access building systems, support infrastructure, etc. to maintain the building in service. The Contractor's operations shall not obstruct access to the building or supporting infrastructure until such time as the building is turned over for construction. Additional phasing requirements are discussed elsewhere in these specifications.

9-1.6. **Temporary Power**: Building 355 includes a PBX that serves surrounding buildings and quads. The PBX must remain in service at all times. Provide temporary power for the PBX throughout project construction. At the completion of construction the PBX shall be connected to the Building 355 electrical system. The PBX must be accessed by various contractors and utility personnel for repair, maintenance, operations, etc. The Contractors operations shall not obstruct access to PBX room at any time.

9-1.7. **Overcurrent Protection**: Overcurrent protection shall be provided for each feeder. Service entrance equipment for each building shall be grouped together and located in the electrical room. The service entrance equipment shall include electric watt-hour meters with integral demand meters. Provide locking seal on meter socket rings. Metering shall be located in an area readily accessible by service personnel. Manual by-pass and test facilities shall be provided for each socket. Metering within a building shall be grouped at one location at the building. Meter sockets shall have provisions for securing the locking ring to prevent removal of the meter by unauthorized personnel. Metering shall be connected to the Quad C DDC

system for monitoring of energy usage. Meter Service entrance conductors shall be sized in accordance with the National Electrical Code. Service feeders shall be underground.

9-1.8. **Loadcenters**: Loadcenters shall be allowed for branch circuits in dwelling units only, to serve dwelling unit loads. Loadcenters shall be rated not less than 70 amperes, mounted in the interior walls of the dwelling unit, and readily accessible. Offset a minimum of 400 mm (16 inches) horizontally back-to-back load centers/panelboards. No recessed loadcenters are to be located in fire walls. Loadcenters shall have separate neutral and ground buses. Load centers shall be circuit breaker type installed in painted galvanized steel recessed, dead-front enclosures. Provide at least 25% spare spaces in each loadcenter. The Amps Interrupting Current (AIC) rating of loadcenters shall be as calculated in the short circuit analysis but shall not be, in any case, less than 10,000 AIC.

9-1.9. **Panelboards**: Panelboards shall be rated not less than 150 amperes, mounted in the interior wails, and readily accessible. Offset a minimum of 400 mm (16 inches) horizontally back-to-back load centers/panelboards. No recessed panelboards are to be located in fire walls. Panelboards shall have separate neutral and ground buses. Panelboards serving non-linear loads (computers, etc.) shall be provided with neutral busses sized at 200% of phase busses. Panelboards shall be industrial bolt-on circuit breaker type installed in painted galvanized steel recessed, dead-front enclosures. Provide at least 25% spare spaces in each panelboard. The Amps Interrupting Current (AIC) rating of panelboards shall be as calculated in the short circuit analysis but shall not be, in any case, less than 10,000 AIC for panelboards operated at 208Y/120 volts and 14,000 AIC for panelboards operated at 480Y/277 volts.

9-1.10. **Outlet Circuits**: Lighting and convenience outlets shall be on separate circuits. Convenience outlets shall be grounded, duplex type, 2 pole, 3 wire. Dwelling unit receptacles shall be rated 15 amperes minimum at 125 volts and connected to 20 amperes minimum branch circuits. Receptacles located in areas other than dwelling units shall be rated 20 amperes minimum at 125 volts and connected to 20 amperes minimum branch circuits. Outlets provided for specified appliances or equipment shall be of the appropriate type and rating. Receptacles shall be grounded and flush mounted in walls and partitions. All receptacles requiring ground fault protection shall be integral with the receptacle. Outlets on party walls shall be offset 610 mm (24 inches) to maintain integrity of the fire wall and sound deadening rating of the wail. Outlets in Telecommunication Rooms (TR) or closets shall be 2 pole, 3 wire, 20 ampere rated with at least two 20 amp, dedicated circuits.

9-1.11. **Conduit and Wiring**: Conduit and wiring shall not be run in concrete slabs-on-grade. Where runs are below concrete slabs-on-grade and in direct contact with earth or fill, conduit shall be of the coated rigid steel thick wall conduit, coated intermediate metal conduit or Schedule 40 polyvinyl chloride (PVC) type. Elsewhere, conduit where required shall be either of the galvanized thick-wall conduit, intermediate metal conduit, or electrical metallic tubing (EMT) type, except that EMT shall not be installed in concrete, exposed to the weather or in other wet locations.

9-1.12. **Calculations and Drawings**: As a minimum, calculations shall be provided for the following: a) lighting for each room and area; b) load analysis to include connected and estimated demand-separate loads by categories such as lighting, receptacles, HVAC, etc; c) voltage drops-do not exceed limits given in the NEC and TM 5-811-1 Electrical Power Supply Distribution; d) short circuit and overcurrent coordination-provide data to verify proper protection and coordination is provided for the equipment/systems. Complete single line diagrams shall be provided with calculations of available short circuits at transformer, all switchboards, panelboards, and loadcenters. Load calculations for each building shall be provided and conform to Article 220 of the NEC. Barracks load calculations shall include cooktops and range hoods, regardless of whether Option Number 2 is awarded or not. Illumination levels shall conform to IES standards and TI 800-01, Chapter 12, table 12-4.

9-1.13. **Historic Preservation**: Any electrical work in or on Buildings 355, 356, 357, or 358, visible from the exterior shall resemble work to be expected on the buildings when originally constructed. Of specific concern are luminaires visible by viewers located outside the buildings, either inside or outside the quad. Luminaires in the building that can be obstructed with window coverings are not a concern. Luminaires located in the exterior covered walkways are not a concern provided they are mounted on the interior face of exterior columns so that they are not visible to viewers standing outside the buildings.

9-1.14. **Building Security Lights**: Outdoor 70-watt high-pressure sodium luminaires shall be provided on the sides of each building to illuminate the perimeter of the building. Quantity and location of fixtures shall be situated to eliminate shadow areas where intruders could remain undetected, yet be coordinated with the architectural features of the structure to minimize spill light into an adjacent building. Luminaire circuit shall be photocell controlled. All luminaires shall be grounded to conform with Article 410 of the NEC and shall be rated for the environment to which the luminaires are exposed. Selection of luminaires shall be based on energy-savings and aesthetics. Outdoor luminaires shall be UL listed as suitable for wet locations and shall have vandal-proof polycarbonate type lens or otherwise impact resistant plastic lens. All luminaires shall be complete with lamps.

9-1.15. **Interior Lighting**: The design of interior lighting shall be in accordance with the fundamentals and recommendations of the IES Lighting Handbook, TI 811-16 Lighting Design, and TI 800-01 Design Criteria.

9-1.15.1. Lighting Intensities: Lighting intensities shall conform to those required by the IES and TI 800-01, Chapter 12, table 12-4. The IES intensities were published as minimums for specific tasks. However, the IES intensities shall be considered target design levels not to be changed significantly. The upper lighting levels shall be considered as maximum design levels.

9-1.15.2. Controls: Lighting controls shall be time clock or photoelectric, or both, for general indoor and outdoor lighting. Automatic dimming to supplement day lighting or occupancy sensors may be considered. Dimming systems may be used to reduce voltage and increase lamp life.

9-1.15.3. Efficiency: Interior lighting will be both efficient and color corrected. Color Rendering Index (CRI) of 85 or better and a standard lighting color of 3500 K are required. Lamps shall be of low mercury type that meets EPA's TCLP (Toxic Characteristic Leaching Procedure) tests and are classified as nonhazardous waste. For 1220 mm (4 ft) fluorescent light fixtures, provide T8, 32-watt lamps. Polystyrene lens is not acceptable. Acrylic diffusers shall be provided. Recessed fluorescent luminaires shall have 0.6604 mm (0.026-inch) minimum thickness for metal housing. Surface mounted fluorescent luminaires shall have 0.8128 mm (0.032-inch) minimum thickness for metal housing. Luminaires on ceilings less than 2250 mm (7 feet-6 inches) above the floor shall be recessed flush type.

9-1.15.3.1. Fluorescent luminaires shall have ETL certified, rapid start, energy saving, high power factor, electronic ballasts with automatic resetting thermal cutout protection, ANSI sound rating "A". Energy saving ballasts shall be CBM certified full light output type.

9-1.15.3.2. Electronic ballast shall as a minimum meet the following characteristics:

a) Ballast shall comply with UL 935, ANSI C82.11, and NFPA 70 unless specified otherwise. Ballast shall be designed for the wattage of the lamps used in the indicated application. Ballasts shall be designed to operate on the voltage system to which they are connected.

b) Power factor shall be 0.95 (minimum).

c) Ballast shall operate at a frequency of 20,000 Hertz (minimum).

d) Ballast shall have light regulation of plus or minus 10 percent lumen output with a plus or minus 10 percent input voltage regulation. Ballast shall have 10 percent flicker (maximum) using any compatible lamp.

e) Ballast shall be UL listed Class P with a sound rating of "A."

f) Electronic ballast enclosure shall be similar in physical size and physically interchangeable with an electromagnetic ballast. Ballast shall have circuit diagrams and lamp connections displayed on ballast packages. Ballast shall operate lamps in a parallel circuit configuration that permits the operation of remaining lamps if one or more lamps fail or are removed.

g) Ballast shall operate in rapid start mode.

h) Electronic ballast shall have a full replacement warranty of 5 years from date of manufacture as specified in paragraph entitled "Electronic Ballast Warranty" herein.

9-1.15.3.3. T-8 Lamp Ballast

a) Ballast shall be capable of starting and maintaining operation at a minimum of 10 degrees C (50 degrees F) for F32T8 lamps, unless otherwise indicated.

b) Total harmonic distortion (THD): Shall be 20 percent (maximum).

c) Input wattage.

(1) 32 watts (maximum) when operation one F32T8 lamp.

(2) 62 watts (maximum) when operating two F32T8 lamps

d) Three lamp fixtures shall have two ballasts per fixture.

9-1.15.3.4. Furnish the electronic ballast manufacturer's warranty. The warranty period shall not be less than 5 years from the date of manufacture of the electronic ballast. Ballast assembly in the lighting fixture, transportation, and on-site shall not exceed 12 months, thereby permitting 4 years of the ballast 5-year warranty to be in service and energized. The warranty shall state that the malfunctioning ballast shall be exchanged by the manufacturer and promptly shipped to the using facility. The replacement ballast shall be identical to, or an improvement upon, the original design of the malfunctioning ballast.

9-1.15.4. Emergency Lighting: Provide emergency lighting utilizing integral battery packs in fluorescent luminaires to illuminate exit paths. Emergency lighting shall be connected to unswitched legs of the lighting branch circuit serving the area. Dual head emergency lights with battery backup shall be provided in areas where use of integral battery packs is not feasible.

9-1.15.5. Illuminated exit signs with battery backup shall be required to mark all emergency exits and passageways, as required by NFPA 101, Life Safety Code. Exit signs shall be energy efficient LED types.

9-1.15.6. Arms Vaults Lighting: Ceiling mounted fluorescent light fixtures shall be provided for the Arms Vaults. The illumination level required for the Arms Vault shall be 750 Lux (75 footcandles). Arms vaults shall also have a light fixture located directly outside the arms vault door and controlled by a switch within the secured area of the arms room.

9-1.15.7. Accent Lighting: Provide special or accent lighting for main entries, conference rooms, lobbies, and/or other unique areas. Accent lighting shall be required for special graphics or displays.

9-1.15.8. Gym Lighting: Remove existing gymnasium lighting and provide new gymnasium lighting in accordance with IES recommendations and design guidance using a metal halide light source for color rendition. Provide dual head battery pack type emergency lighting units in the gymnasium.

9-1.16. **Smoke Detectors: See Chapter 12, Fire Protection**. Smoke detectors shall not be located in close vicinity of the bathroom entrance to preclude false alarms. Detectors shall be of the ionization or photo-electric type conforming to the requirements of Underwriters Laboratories Standards No. 217. Detectors shall bear labels, indicating compliance with standards, by a recognized independent laboratory that maintains periodic inspection of production and testing of the detectors provided.

9-1.17. **Door Chimes**: Push buttons shall be provided at front entrances to each dwelling unit. The system shall include wiring, push buttons, transformer and chimes. System shall be designed for operation at less than 50 volts. Splices in wiring shall be made only where they will be accessible upon completion of the building.

9-1.18. **Branch Circuits and Convenience Outlets**: Provide a minimum of one general purpose 120 volt, 20 or 15 ampere duplex receptacle outlet in each room. In rooms where walls exceed 3 meters, provide an additional duplex outlet for each additional 3 meters of wall or fraction thereof. Receptacle spacing shall not exceed 3 meters. Not more than 8 general purpose convenience duplex receptacles shall be connected to a single branch circuit. Not more than 4 general purpose convenience duplex receptacles serving computer workstations shall be connected to a single branch circuit with a non-shared neutral. The general purpose receptacles are in addition to receptacles dedicated for special equipment and appliances (such as refrigerators and microwaves), which shall be on dedicated circuits. Provide dedicated receptacle circuits for FAX, copy machine equipment, and laser printers and coordinate the locations with the users. Ground fault circuit interrupter (GFCI) receptacles shall be 15A or 20A, 120V with test and reset button integral with the receptacle. GFCI receptacles shall not be used in "feed thru" applications to protect downstream receptacles on the same branch circuit.

9-1.18.1. Dwelling Unit Bedrooms: All branch circuits that supply 120 volt, single-phase 15 and 20 ampere outlets in dwelling unit bedrooms/sleeping areas shall be provided with arc-fault circuit interrupters in accordance with NEC 210.12.

9-1.18.2. Bathrooms: A duplex, ground fault circuit interrupter (GFCI) receptacle shall be provided adjacent to the lavatory. Bathroom receptacle outlets shall be supplied by at least one 20-ampere branch circuit. Such circuit shall not have other outlets.

9-1.18.3. Typical Dwelling Unit Loads: Each dwelling unit shall be provided with a loadcenter. Electrical loads for that dwelling unit shall be connected to the respective dwelling unit loadcenter, including but not limited to:

a) Cooktop (Option Number 2)

b) Range Hood (Option Number 2)

c) Garbage Disposal (Option Number 2)

d) Refrigerator

e) Microwave Oven

f) Air Handler Unit

Should Option Number 2 not be awarded, provide spare circuits in each dwelling unit loadcenter for future installation of the cooktop, range hood, and garbage disposal. Breakers for cooktops shall be interspersed on the dwelling unit loadcenters so that when cooktops are installed, loading on the three electrical phases will be balanced.

9-1.18.4. Ground fault circuit interrupter (GFCI) receptacles shall be provided in accordance with the NEC.

9-1.18.5. Hallway outside bedrooms. For hallways of 3000 mm (10 feet) or more in length, at least one duplex receptacle shall be provided.

9-1.18.6. Entrance. A weatherproof, duplex, ground fault circuit interrupter (GFCI) receptacle shall be provided near each entrance to each building.

9-1.19. **Non-Linear Loads**: In all areas where nonlinear load type equipment predominates such as computers, printers, uninterruptible power supply (UPS), motors with variable speed drives, electronic ballasts and dimmers and other similar loads, ETL 1110-3-403, "Electrical Power Systems for Nonlinear Loads" dated 30 June 1989; IEEE Std 1100 "Powering and Grounding Sensitive Electronic Equipment", IEEE Std. 519, "Practices and Requirements for Harmonic Control in Electrical Power Systems" shall be used as design guides. Additionally, the use of 75 or 90 degree C (minimum) terminals and insulated conductors is required and shall be so stated in the project and identified in the RFP documents. Use 75 degree C conductors on circuits with protective device terminals rated for 60 degree C is inappropriate. National Electrical Code (NEC) and Underwriter's Laboratory (UL) rules and instructions shall be followed in applying the ampacity tables in the NEC beginning with Table 31-6. Since virtually all electrical equipment that meets the approval required by article 110-2 of the NEC is UL listed, the equipment must be installed in accordance with UL instructions. The basic rule of the UL Electrical Construction Materials Directory states that, in general, "the termination provisions are based on the use of 60 degree C ampacities for wire sizes No. 14-1 AWG and, 75 degree C ampacities for wire sizes Nos. 1/0 AWG and larger, as specified in Table 310-16 of the National Electrical Code." Higher rated conductors than specified may be used if the size is based upon the previous statements. Panelboards and loadcenters serving nonlinear loads shall have double-rated neutral busses. Motors connected to the same power source as nonlinear loads shall be upgraded in size similarly. True RMS sensing meters, relays, and circuit breaker trip elements shall be used with nonlinear loads.

9-1.20. **Transformers:** Transformers and dielectrics shall be selected and applied in accordance with ETL 1110-3-412 "Transformer Application Guide". For those areas with high nonlinear loads, "K" factor rated transformers are required. Provide a schedule identifying the “K" factor rating for each area. Ratings shall be based upon type of load served. Interior transformers having a primary voltage less than 600 volts shall be of the ventilated-dry-type and shall not exceed 500 kva capacity. Heat load calculation shall be provided to ensure temperature rise is acceptable.

9-1.21. **Wiring**: Conductors shall be copper, 12 AWG minimum for power and lighting circuits. Aluminum conductors are not allowed. Conductors No. 10 AWG and smaller shall be solid, and those No. 8 AWG and larger shall be stranded. Unless indicated otherwise, all wiring, installed in galvanized rigid steel conduit (GRS), intermediate metal conduit (IMC) or electrical metallic tubing (EMT), shall be 600 volts, type THW, THWN, XHHW or RHW, except that grounding wires may be type TW. The wiring methods in the various parts of the facility must be clearly identified on the contract drawings. Underfloor ducts or overhead

raceways for electrical wiring and information systems cabling may be provided in administrative areas with requirement too extensive to be served by wall outlets. Remote-control and signal circuits shall be type TW, THW or TF, No. 14 AWG minimum. Service entrance cables shall comply with UL 854. All wiring shall be concealed.

9-1.22. **Motors**: Motors having a starting current that will cause a 30% transient voltage dip shall have reduced-voltage or current-limiting controllers. The selection of motors and motor controls shall be done in a systematic manner with consideration of the overall efficiency of the system. Motor efficiencies shall meet or exceed the minimum requirements set forth by the Department of Energy where non-proprietary products are available.

9-1.23. **Prewired Workstations**: Coordinate early in the design process with the User and the architect concerning the necessary electrical characteristics of the workstation wiring systems. In order to facilitate a non-proprietary workstation, it may be necessary to provide alternate electrical distribution schemes to match the various methods used in potential supplier's manufactured products. Power and telecomm cables shall be physically separated from each other by metal raceway or metal partitions. See telecommunications section for telecommunications requirements.

9-1.24. **Coordinated Power System Protection**: The electrical interior distribution system requires short circuit calculations to ensure proper coordination of the protective devices. This analysis shall be performed in accordance with TM 5-811-14 Coordinated Power Systems Protection. The envelope of coordination for which the proposer is to be responsible must be shown on the drawings and in the design analysis. Special coordination requirements shall be noted on the drawings. Also, situations where complete coordination is not achievable due to device limitations shall also be noted on the drawings and design analysis.

9-1.25. **Electronic Security Systems**: Electronic security systems shall be designed in accordance with TM 5-853-4 Electronic Security Systems Technical Manual. Arms vaults shall be properly designed for Joint Service Interior Intrusion Detection System (JSIIDS). This limited system is used for interior intrusion detection system (IDS) and consists of a control unit, DTM (a data transmission link such as wire line, fiber optics, coaxial cables, or radio frequency transmission), balanced magnetic switch, capacitance proximity sensor, grid wire sensor, passive ultrasonic sensor, ultrasonic motion sensor, and a duress sensor. Telecommunications entrance facilities shall have Balanced Magnetic Switches (BMS) on their doors.

9-1.26. **Closed Circuit TV (CCTV) Raceway Systems**: A CCTV system will be required to monitor selected building entries, exits, spaces, and areas adjacent to buildings. The CCTV system devices and cabling shall be by the Government. Provide raceways, outlet boxes, junction boxes, terminal cabinets and electrical connections necessary to accommodate the CCTV system. Coordinate CCTV raceway system requirements with DOIM.

9-1.27. **Personnel Alerting System (PAS)**: Provide a PAS for the entire quad in compliance with UFC 4-021-01 Mass Notification Systems. This system shall be compatible with the existing base master transmitting/receiving equipment, which is a microprocessor controlled wireless personnel alerting system. Coordinate PAS requirements with the Military Police Brigade (Physical Security Office) and other cognizant security personnel.

9-1.28. **Point of Sale System**: The dining facility will include a Point of Sale system based either on a cash register type systems or a debit card system. Coordinate specific requirements with the User and provide point of sales system, raceways, wiring, electrical connections, etc.

9-1.29. **Roof Access Pathways**: Various User systems will require pathways for their systems, including but not limited to radio antennas for radio systems. Provide raceways with pullwire from the various user

areas to the roof. Provide adequate 120 volt power and space for equipment. Coordinate power, space and raceway requirements and equipment locations with Users. At the roof provide a weatherproof entrance fitting, sealed to prevent the entry of rodents, insects, etc., for installation of cables, antennas, etc., by others.

9-1.30. **Exterior Enclosures**: Enclosures for switchboards, safety switches, panelboards, motor starters, circuit breakers, and control devices exposed to the weather shall be in NEMA 4X enclosures.

9-1.31. **Public Address (PA) System**: A PA system shall be installed with full coverage within the dining facility, including the kitchen, food preparation areas, serving areas, check-in, snack bar, and dining rooms. Each room and separate area shall have individual volume controls for music, with an override feature for voice announcements. The PA system equipment shall be rack mounted complete with an amplifier, tuner, multi-disk CD player, and microphones. Microphone outlets shall be installed at each check-in stand and the office.

**9-2. TELECOMMUNICATIONS PREMISES DISTRIBUTION SYSTEM (Interior Telecommunication System)**

9-2.1. **Telecommunications Premises Distribution Systems Design**: The premises distribution system (PDS) design shall be in accordance with the Department of Army's Installation Information Infrastructure Architecture (I3A), Design and Implementation Guide, dated April 2001 and the local addendum's to the I3A. Technical criteria to be used for design and construction shall be taken from the most current references at the date of issue of the Request for Proposals (RFP) and shall only be modified as described herein. Codes and standards specifically referred to and those listed below shall be the minimum acceptable criteria.

| STANDARD NUMBER | DESCRIPTION (STANDARDS ARE ADOPTED FEDERAL-GOVERNMENT AND DOD) |
|---|---|
| ANSI/TIA/EIA-568-B | Commercial Building Telecommunications Cabling Standard |
| ANSI/TIA/EIA-569-A | Commercial Building Standards for Telecommunications Pathways and Spaces |
| ANSI/TIA/EIA-570-A | Residential Telecommunications Cabling Standard |
| ANSI/TIA/EIA-598-B | Optical Fiber Cable Color Coding |
| ANSI/TIA/EIA-606-A | Administration Standards for the Telecommunications Infrastructure of Commercial Buildings |
| ANSI/TIA/EIA-607-A | Commercial Building Grounding and Bonding Requirements for Telecommunications |
| ANSI/TIA/EIA-758-1 | Customer-Owned Outside Plant Telecommunications Cabling Standard |
| TIA/EIA-TSB67 | Transmission Performance Specifications for Field testing of Unshielded Twisted-Pair Cabling Systems |
| TIA/EIA-TSB72 | Centralized Optical Fiber Cabling Guidelines |
| TIA/EIA-TSB75 | Additional Horizontal Cabling Practices for Open Offices |
| NEMA WC 66 | Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pair Cable |
| | |
| * TSB = Telecommunications System Bulletin | |

9-2.1.1. Features of the premise wiring system are as follows:

a. Prewiring of the building in accordance with Federal and National Standards i.e. Telecommunications Industry Association (TIA) and Electronic Industries Association (EIA).

b. Use of 4 pair, 24 AWG, solid conductor, 100 ohm, unshielded twisted-pair (UTP), thermoplastic jacketed, category 6 or better rated copper cables is required for horizontal cabling except where fiber optic cables (FOC) are used or required. If fiber optic cables are used for LAN systems, confirm use of single or multimode fiber optic cable and type of connector with DOIM. All terminations shall be wired in accordance with EIA/TIA 568B.

c. Use of distribution devices, such as patch panels or 110 Blocks shall be installed with wire management devices. RJ21X or 66 Blocks shall not be used.

d. Star wiring architecture from the distribution device is required.

e. Telecommunications outlets shall consist of 2 types as shown in attachment 24, “Telecomm Details”. Type W consists of one jack. Type B consists of 2 jacks. Each jack shall be connected to a dedicated cat 6 cable run back to the telecomm room.

f. Telecommunications outlets shall be installed as follows:

All office rooms--minimum of one type B outlet per 7.43 square meter (80 square feet) of space
Arms Vault--one type W outlet
Conference room--one type B outlet
Lounge--one type B outlet
Gym--one type W outlet
Game room--one type B outlet
Bedroom--one type W outlet in each bedroom
Dining room--one type B outlet near the entrance
Dining check-in room--one type B outlet at each of the two check-in stations (total of 2 outlets)
Kitchen--one type W outlet
Snack Bar--one type B outlet
Classroom--minimum of one type B outlet on each wall
Loft--one type B outlet
Elevator--one type W outlet
SIPRNET Room--one type W outlet

g. Category 6 telecommunication jacks shall be configured in the T568A configuration.

h. Provide a minimum of 12 strands of single mode fiber optic fiber from the main telecommunications room in each building to each telecommunications room in that building.

i. Use of an auxiliary disconnect outlet if necessary.

j. Grounding shall be in accordance with ANSI/TIA/EIA 607 or 758.

9-2.2. **Telecommunications Outlets**: Telecommunications outlets shall be 6 position, Category 6 flush mounted type, wired in the T568A configuration. Each outlet shall have the designated number of 8 conductor, Category 6 cables in a concealed 27 mm (1") or larger EMT conduit. Cabling methods shall comply with the appropriate ANSI/EIA Standard. Cabling and jacks shall be Category 6 and of high quality.

All telecommunications outlets shall have a factory made color identification device so that all users can easily identify voice (blue) or data (green).

9-2.3. Telecommunications Rooms: A telecommunications entrance facility will be placed in each building on the ground floor and with an external door. Besides the main entrance, a telecommunications room shall be placed for every 929 square meters (10,000 square feet) or fraction thereof. All telecommunications rooms or entrance facilities shall be keyed differently and with high security locks, and shall have "Telecommunications" permanently labeled on the door. Telecommunications entrance facilities shall have Balanced Magnetic Switch (BMS) intrusion detection on their doors. The minimum telecommunications room size shall be in accordance with I3A, ANSI/TIA/EIA-569A, and the local telecommunications requirements. A minimum of four 103 mm (4-inch) conduits with MuleTape shall be extended from the telecommunications entrance facility into the underground telecommunications distribution system and tied off at the first maintenance hole or handhole. Those conduits supporting fiber optic cabling will utilize shall be provided with an engineered fabric inner duct and shall not require MuleTape. The number and size of the telecommunications rooms and entrance facilities shall be coordinated with DOIM's Infrastructure Management Group.

9-2.4. Conduit and Cabling: Contractor shall provide minimum 27 mm (1") conduits, complete with telecommunications cables and standard T568A modular jack outlets for telecommunications service. Provide each jack with a cable in conduit routed directly to the telecommunications room. No section of conduit shall contain more than two 90-degree bends between pull points or pull boxes. During cable installation, the rated cable pulling tension shall not be exceeded and cable shall not be stressed such that twisting, stretching, or kinking occurs. Conduit and wiring shall not be run in concrete slabs-on grade. Where runs are below concrete slabs-on-grade and in direct contact with earth or fill, conduit shall be of the coated rigid steel thickwall conduit, coated intermediate metal conduit or Schedule 40 polyvinyl chloride (PVC) type. Elsewhere, conduit where required shall be either of the galvanized thickwall conduit, intermediate metal conduit, or electrical metallic tubing (EMT) type, except that EMT shall not be installed in concrete, exposed to the weather or in other wet locations. Use of flexible plastic or metallic conduit is prohibited.

9-2.5. Pay Telephones: Coordinate pay telephone locations with AAFES.

9-2.6. Secret Internet Protocol Router Network (SIPRNET) Facilities for building 357 only: Provide a vault type secure room on the third floor of building 357, including intrusion detection alarm system and air conditioning, to house classified terminal equipment in accordance with Chapter 7 of AR 380-5. SIPRNET wiring shall consist of fiber optic cable routed through a Protected Distribution System (PDS) (sealed steel conduit, boxes, fittings, etc.) from the secured room to each end user workstation. PDS shall be in accordance with Chapter 4 of AR 380-19 and National Security Telecommunications and Information Systems Security (NSTISSI) No. 7003. Fourteen end user workstation outlets shall be located on the 3rd floor of building 357 as follows: 1 each in the CO and XO offices, 2 each in the S1, S4, and S6 offices, and 3 each in the S2 and S3 offices. Each outlet shall have a heavy duty fiber optic connector in a lockable steel box. Coordinate all exact locations and details with DOIM.

## 9-3. INTERIOR CABLE TELEVISION SYSTEM

9-3.1. Television Outlets: Flush mounted Television (TV) outlets shall be provided in each bedroom, dining room, conference rooms, classrooms, CO Offices, game rooms, and as required by the user. Outlets shall be Type F female plugs. The outlets shall be prewired and pretested. For RG-11 outlets, use 103 mm x 103 mm x 61 mm deep (4" x 4" x 2'/$_4$." deep) outlet box with 16mm ($^1/_2$") minimum rise.

9-3.2. Cabinet: A television terminal cabinet for each building shall be provided and installed in the Telecommunications Room. Coordinate minimum size of cabinet and the type of termination requirements

with Oceanic Cable and Verizon Media Ventures as facilities shall support both vendors simultaneously. The drawing TYPICAL CATV RISER CONDUIT HOMERUN SYSTEM included in with the RFP drawings provides design guidance for Oceanic Cable interior distribution systems. Each terminal cabinet shall be provided with a 21 mm (3/4-inch) termite treated plywood backboard and an insulated #6 AWG copper ground conductor with 900 mm (3 ft) slack in each cabinet. The cable in conduit shall terminate to a common terminal board in the television terminal cabinet or as mutually agreed by Oceanic Cable and Verizon Media Ventures. The cover for the cabinet shall be provided with means for padlocking, and shall be permanently labeled "Television." Final location of the television terminal cabinet shall be coordinated and mutually approved by Oceanic Cable and Verizon Media Ventures. For each building, provide a conduit from the cabinet to the roof of the building as a provision for cable installation from antenna to cabinet by Verizon Media Ventures to preclude Verizon Media Ventures from routing exposed cable. Conduit shall be routed from cabinet concealed in wall up to roofline where it may be routed exposed by penetration of the roof. Coordinate with Verizon Media Ventures and provide appropriate weatherproof transition fitting from conduit to cable.

9-3.3. Conduit and Wiring: For each building, all CATV cable shall be installed in a conduit. For Oceanic Cable and Verizon Media Ventures, 75 ohm, RG-6/U, black, non-messenger, tri-shield, 80% aluminum braid, PVC jacketed coaxial cable shall be used for cable lengths under 200 ft For cable lengths greater than 200 ft, the CATV cable shall be 75 ohm RG-11/U, bonded foil, shielded type which includes an inner layer of laminated tape of aluminum foil bonded to the conductors insulation with a layer of adhesive plus 60% aluminum braid, PVC jacketed coaxial cable. Conduit and wiring shall not be run in concrete slabs-on-grade. Where runs are below concrete slabs-on-grade and in direct contact with earth or fill, conduit shall be of the coated rigid steel thick-wall conduit, coated intermediate metal conduit or Schedule 40 polyvinyl chloride (PVC) type. Elsewhere, conduit shall be either of the galvanized thickwall conduit, intermediate metal conduit, or electrical metallic tubing (EMT) type, except that EMT shall not be installed in concrete, exposed to the weather or in other wet locations. Use of flexible plastic or metal conduits are prohibited. CATV conduit shall be concealed where practicable. Type of cable, type of tap-offs or splitters, and outlet boxes shall be coordinated with Oceanic Cable and Verizon Media Ventures. The following is Oceanic Cable conduit capacity guidelines:

21 mm Conduit ($^3/_4$"C) = 1 to 2 each RG-6 with pullwire.

35 mm Conduit ($1^1/_4$"C) = 1 to 4 each RG-6 with pullwire.

41 mm Conduit ($1^1/_2$"C) = 1 to 5 each RG-6 with pullwire.

9-3.4. All inside wiring shall be identified and tagged with the building number, room, and outlet designation. All inside wiring shall be homerun from the backboard/TV cabinet in the Telecommunication Room to the TV outlet in the room. Refer to RFP drawings for TYPICAL CATV RISER CONDUIT HOMERUN SYSTEM.

9-3.5. The proposer is advised that if the CATV equipment is located in a room accessible to the building occupants, Oceanic requires CATV cabinets. Oceanic will provide CATV cabinets to the proposer and the proposer shall install. If the CATV equipment is to be located in a secured locked room not accessible to the building occupants. Oceanic will place the necessary CATV equipment on the proposer provided backboard and CATV cabinets will not be required in this case. Also note that duplex 103mm (4") square receptacles are required at the CATV cabinet or backboard. The number of receptacles is to be determined by Oceanic upon reviewing the plans. If multiple receptacles are needed, space receptacles 155mm to 208 mm (6" to 8") apart.

9-3.6. Coordination with Oceanic Cable and Verizon Media Ventures: The Contractor is advised that both

Oceanic Cable and Verizon Media Ventures require drawings to be submitted for approval which show at a minimum, locations of outlets and boxes, routes, types and sizes of supporting facilities. The Contractor is also advised that these companies may decline to review drawings which they consider inadequate in detail. The Contractor shall be responsible for coordinating with Oceanic Cable and Verizon Media Ventures to ensure what is proposed meets all their requirements. If any of Oceanic Cable and Verizon Media Ventures requirements are not met, the Contractor shall provide what is required at no cost increase to Oceanic Cable, Verizon Media Ventures, and/or the Government. The Contractor shall provide one week notice before conduit installation begins. Oceanic Cable point of contact is Mr. Dean Yonezawa, (808) 625-8456; Verizon Media Ventures point of contact is Mr. Richard Filanc, (808) 832-6590.

## 9-4. EXTERIOR ELECTRICAL DISTRIBUTION SYSTEM

9-4.1. General: TM 5-811-1, Electrical Power Supply and Distribution provides baseline design criteria, standards, policy and guidance for the design of the electrical power supply and distribution systems. Designs shall be compatible with existing construction provided this does not conflict with criteria, standards and policy in TM 5-811-1.

9-4.2. Codes: Electrical systems and installation requirements shall adhere to the current editions of ANSI C2, National Electrical Safety Code, NFPA 70, National Electric Code, and TM 5-811-1 Electrical Power Supply Distribution. In addition, transformers shall be installed in accordance with the guidance provided in UFC 3-600-01 Fire Protection Engineering for Facilities.

9-4.3. Standards: All equipment, materials and appurtenances provided under this contract shall be suitable for the intended application and shall conform to the current edition of applicable standards of one or more of the following:

National Electrical Manufacturer's Association
American National Standards Institute
Insulated Power Cable Engineers Association
American Society for Testing and Materials
Institute of Electrical and Electronics Engineers.
Underwriters' Laboratories, Inc.

Where no such standards exist for any product provided under this contract, the Contractor shall demonstrate the suitability of the product, for the application intended, to the satisfaction of the Contracting Officer.

9-4.4. Grounding: All exposed non-current carrying metallic parts of electrical equipment, metallic raceway systems, grounding conductors and the neutral conductor of the wiring system shall be grounded, except where specifically indicated otherwise. The ground connection shall be made as required by Article 250 of the NEC. Where ground rods are required, they shall be 21 mm (3/4-inch) by 3000 mm (10-feet) copper-clad steel driven so the top is 155 mm (6 inches) below grade. Rods shall be tested for compliance with NEC ground resistance requirements prior to connection.

9-4.5. Locks: All enclosed electrical equipment shall be equipped with padlocks and furnished with two keys with each lock. All locks shall be master keyed.

9-4.6. Ducts: A minimum of 25% spare ducts (1 duct minimum) shall be provided for each duct line. Duct lines shall not pass beneath any building structures. Similarly, building structures shall not be constructed over any duct line. Primary conductors shall be in concrete encased thin-wall PVC ducts, routed through manholes. Electrical secondary, telecommunication, and cable television cables or

conductors shall be non-encased direct burial ducts, except those ducts installed under roads or concrete driveways or other paved areas exceeding 1524mm (5 feet) in width which shall be encased with a minimum of 78 mm (3 inches) of concrete around each duct. Such encasement shall extend a minimum of 1524 mm (5 feet) beyond the edge of the road or paved area. Provide duct seal for where cable enters ducts and covers on spare duct openings. Field cuts requiring tapers shall be made with proper tools and match factory tapers. After an electrical duct line is completed, a standard flexible mandrel shall be used for cleaning followed by a brush with stiff bristles. Mandrels shall be at least 305 mm (12 inches) along and have diameters 6.5 mm ($^1/_4$ inch) less than the inside diameter of the duct being cleaned. For telecommunication ducts, the size of the mandrel shall be as DOIM specifies. For cable television ducts, a rigid 305 mm (12 inch) mandrel with diameter 6.5 mm ($^1/_4$ inch) less than the inside diameter of conduit shall be used for ducts larger than 53 mm (2 inch). A flexible mandrel with a diameter 16 mm ($^1/_2$ inch) less than the inside diameter of conduit shall be used only for 53 mm (2 inch) ducts. Mandrels shall be provided by Oceanic Cablevision only for final testing of CATV ducts. A coupling recommended by the duct manufacturer shall be used whenever an existing duct is connected to a duct of different material or shape. If burrs or obstructions are encountered in electrical, telecommunication, or cable television ducts, that section of the duct shall be replaced.

9-4.6.1. Concrete Encased Ducts: The encasement shall be a minimum of 78 mm (3 inches) of concrete around each duct. Separators or spacing blocks shall be made of steel, concrete, plastic, or a combination of these materials placed not further apart than 1219 mm (4 feet) on centers. Ducts shall be securely anchored to prevent movement during the placement of concrete and joints shall be staggered at least 155 mm (6 inches) vertically.

9-4.6.2. Nonencased Direct Burial Ducts: Where bottoms of trenches comprise materials other than sand or stone-free earth, 78 mm (3-inch) layers of sand or stone-free earth shall be laid first and compacted to approximate densities of surrounding firm soil before installing ducts in direct-contact tiered fashion. Joints in adjacent tiers of duct shall be vertically staggered at least 155 mm (6 inches). The first 103 mm (4-inch) layer of backfill cover shall be sand or stone-free earth compacted as previously specified. High-tiered duct banks shall use a wooden frame or equivalent form to hold ducts in alignment prior to backfilling. Selected earth at duct banks shall be thoroughly tamped in 103 mm to 155 mm (4- to 6-inch) layers. Burial depth of non-encased ducts for cables with a rating of 600 volts or less and for telephone/television cables shall be a minimum of 610 mm (24 inches). Where nonencased ducts for telephone/television cables share the same trench with ducts for secondary cables with a rating of 600 volts or less, the ducts shall be separated not less than 305 mm (12 inches).

9-4.6.3. Duct Line Markers/Plastic Marking Tapes: Duct line markers shall be provided at the ends of long duct line stub-outs or for other ducts whose locations are indeterminate because of duct curvature or terminations at completely below-grade structures. A 5-mil brightly colored plastic marking tape not less than 155 mm (6 inches) in width and suitably inscribed at not more than 3048 mm (10 feet) an centers with a continuous metallic backing and a corrosion resistant 1-mil metallic foil core to permit easy location of the duct line, shall be placed approximately 305 mm (12 inches) below finished grade levels of such lines.

9-4.7. Conductors: All conductors shall be copper.

9-4.8. Nameplates: Each primary circuit breaker, secondary switchboard or switchgear, and secondary circuit breaker panel shall be identified with a laminated phenolic plastic nameplate. Each primary and secondary feeder shall be identified with a fiber or a non-ferrous metal tag.

9-4.9. Point of Connection: Power shall be extended to Quad C from existing 9-2 kV radial circuits 13 and 18. The electrical point of connection for Quad C for circuit 13 shall be the existing electrical manhole system in Waianea Avenue. The Contractor shall extend electrical ductline and high voltage cables to the

site from that manhole system and terminate those feeder cables on a new high voltage switch F18-2A near the comer of Waianae Avenue and Flagler Road. The point of electrical connection for Quad C for circuit 18 shall be the existing high voltage switch, F18-2 located at the comer of Waianae Avenue and Flagler Road. Please refer to RFP drawings for location. New looped primary feeders circuits shall be extended from existing high voltage switch F18-2 and new primary switch F18-2A to building service transformers for increased reliability. Please refer to RFP drawings for one-line diagram.

9-4.10. Demolition: Remove the existing oil-filled pad mounted transformer feeding the quad and the existing secondary underground distribution system feeding Buildings 355, 356, 357, and 358. Remove the existing underground distribution system cables and raceways (ductlines, manholes, handholes, pullboxes, etc.) within the Quad. Remove the existing underground primary and secondary distribution system cables and raceways (ductlines, manholes, handholes, pullboxes, etc.) from existing primary high voltage switch “F18-2” to the Quad. Provide ductline and cabling to terminate existing high voltage circuits on new high voltage switch F18-2A. Disposal of the oil filled transformer shall be considered incidental to the work. Completely remove unused ductlines and cables.

9-4.11. Outages: The Contractor shall initiate requests for outages no less than 45 calendar days prior to any interruption of service in the existing electrical system. Written requests shall be forwarded to DPW via the contracting Officer. Switching shall be performed by DPW authorized personnel.

9-4.12. System Design: Provide new electrical distribution system as necessary and connect to the existing primary electrical system. The distribution system shall be underground for both primary and secondary conductors. The primary system feeds to the existing primary switch F18-2 and new primary switch F18-2A shall be radial feed and shall be compatible with the system of which it becomes an extension. From existing primary switch F18-2 and new primary switch F18-2A new looped feeders shall be extended to building transformers. Loads on the primary system shall be distributed evenly on the three electrical phases. A multiple grounded neutral conductor shall be routed with the phase conductors. Tag all cables to identify phases. All electrical materials and equipment shall be rated for future operation at 12.47 kV, although the current operation shall be at 7.2 kV line-to-line. The existing nominal system is 7.2 kV, 3-phase, delta with grounding transformers at the Base substation. New distribution systems and extensions of existing system shall provide for proper coordination of protective devices. Short circuit and protection coordination studies shall be part of the design analysis. Refer to TM 5-811-14, Coordinated Power Systems Protection for guidance on protective coordination studies and the selection of protective devices.

9-4.13. Calculations and Diagrams: Complete single line diagrams shall be provided with calculations of available short circuit currents at each transformer and circuit breaker panel; loads on all transformers and feeders; and voltage drops on primary lines and secondary services. Illumination and uniformity calculations for multipurpose courts shall also be provided. Diagrams, calculations, and drawings shall be prepared under the supervision of a United States registered professional electrical engineer. Calculations shall be based on inclusion of cooktop and range hood loads, regardless of whether Additive Alternate Number 2 is awarded or not.

9-4.14. Voltage Drops: The length of secondary distribution service laterals from the building transformers to the building service entrances shall be minimized. The voltage drop from the unit substation to each building's service entrance equipment shall not exceed 2%. The voltage drop from the service entrance equipment to the farthest outlet of lighting, power, or combination of such loads shall not exceed 5%.

9-4.15. Demand Loads: A separate demand load calculation shall be provided for each building. Include catalog cuts of the electrical data for the HVAC equipment that was selected by the mechanical engineer.

9-4.16. Primary Cable: Primary cable shall be ethylene propylene rubber insulated, polyvinyl chloride jacketed, 25% copper tape shield overlap. Conductors shall be copper, sizes larger than no. 8 AWG shall be stranded. Cables shall have a voltage rating of at least 15 kV with 133 percent insulation level. Cable shall be #2, #4/0, or 250 kcmil standard sizes. Deviations from these sizes shall be coordinated and approved by Mr. Roger Grace, DPW, phone no. 655-2942, ext. 1223.

9-4.17. Underground Splices: Splices shall be in self-draining, rodent-resistant manholes with traffic rated covers. Primary cable shall be installed without splice in runs of 152 meters (500 ft) or less. "Y" and "T" splices shall not be used. Instead, circuit cabling shall terminate at high voltage switches and taps shall be extended from dedicated fused switch positions. The high voltage switches shall be exterior type rated 15 kV, 600 amperes minimum with 3-pole gang-operated switches as indicated on RFP drawings. The maximum spacing between manholes shall be 91 meters (300 ft). Primary cables shall be fire-proofed for their entire length within a manhole on an individual cable basis. Fireproofing shall extend at least 25 mm (1 in) into the ducts. Systems shall be listed as a fire protective coating for grouped electrical conductors and shall be suitable for application on the type of medium voltage cables provided. After fully cured, the installation shall be suitable for use where exposed to oil, water, gases, salt water, sewage, and fungus whereby no resulting damage to cable or insulation shall occur.

9-4.18. Secondary Conductors: Secondary underground cables shall conform to UL 854 and shall be copper, type RHH-RHW-USE insulation, cross-linked polyethylene or ethylene-propylene-rubber outer covering. Conductors shall be installed in non-encased PVC thick wall ducts and where practical, located below sidewalks. Ducts located below areas subject to vehicular traffic shall be concrete encased. Secondary cable splices shall be made in splice boxes approved for the purpose and in accordance with the manufacturer's recommendations.

9-4.19. Service Entrance: Only one service entrance per building shall be provided.

9-4.20. Building Transformers: Transformers at buildings shall be liquid-filled pad-mounted type having the ratings and arrangements that are compatible and suitable for proper operation of the facility. Medium voltage ratings of cable terminations shall be 15 KV between phases for 133 percent insulation level. Provide a single primary feeder to the unit from the adjacent pad high voltage switch. Where secondary feeders exit the transformer, provide tags to indicate building numbers. Pad for the unit substation shall be concrete. Provide a concrete oil spill containment berm around the transformer pad. The containment area within the berm shall be of sufficient volume to contain the entire oil content of the transformer plus 10%. In addition, provide such additional design (including consultation with other trades) to ensure that the installation will comply with 40 CFR Part 112 Oil Pollution Prevention and Response; Non-Transportation Related Onshore and Offshore Facilities. Civil design analysis shall confirm that any work necessary to ensure that spills will not migrate into navigable waters is included in the project. The transformer shall have "Danger High Voltage" signs affixed to all four sides of the enclosure. The transformers shall be located as indicated on RFP drawings and shall be accessible to service personnel for maintenance operations. Area surrounding the transformer shall be appropriately treated for AT/FP concerns. When necessary, architectural screening may be used to provide a pleasing appearance but the screening must assure no loss in equipment efficiency. Enclosures shall be corrosion resistant stainless steel construction with a factory applied Norwood Brown color, Federal Color No. 10045.

9-4.20.1. Pad-Mounted Transformers: Pad-mounted transformers shall comply with ANSI C59-12.26. Pad-mounted transformer stations shall be assembled and coordinated by one manufacturer and each transformer station shall be shipped as a complete unit so that field installation requirements are limited to mounting each unit on a concrete pad and connecting it to primary and secondary lines. Stainless steel pins and hinges shall be provided. Barriers shall be provided between high- and low-voltage compartments. High-voltage compartment doors shall be interlocked with low-voltage compartment doors to prevent access

to any high-voltage section unless its associated low-voltage section door has first been opened. Compartments shall be sized to meet the specific dimensional requirements of ANSI C59-12.26. Pentahead locking bolts shall be provided with provisions for a padlock.

9-4.20.1.1. The high-voltage compartment shall be dead-front construction. Primary switching and protective devices shall include loadbreak switching, oil-immersed, current-limiting, bayonet-type fuses, medium-voltage separable loadbreak connectors, integral one-piece bushings and surge arresters. The switch shall be mounted inside transformer tank with switch operating handle located in high-voltage compartment and equipped with metal loop for hook stick operation. Fuses shall be interlocked with switches so that fuses can be removed only when the associated switch is in the "OPEN" position. Adjacent to medium-voltage cable connections, a nameplate or equivalent stenciled inscription shall be provided inscribed "DO NOT OPEN CABLE CONNECTORS UNLESS SWITCH IS OPEN." Surge arresters shall be fully insulated and configured to terminate on the same bushing as the primary cable by means of a loadbreak, feed-through bushing insert.

9-4.20.1.2. Load-Break Switch: Radial-feed oil-immersed type rated at 15 kV, 95 kV BIL, with a continuous current rating and load-break rating of 200 ampere, and a make-and-latch rating of 10,000 rms amperes symmetrical. Locate the switch handle in the high-voltage compartment.

9-4.20.1.3. Transformer Tank Section: Transformers shall comply with IEEE ANSI/IEEE C59-12.00, ANSI C59-12.21, and ANSI C59-12.26 and shall be of the mineral oil-insulated type. Transformers shall be suitable for outdoor use and shall have 2 separate windings per phase. Standard NEMA primary taps shall be provided. Where primary taps are not specified, 4 each $2^1/_2$ percent rated kVA high-voltage taps shall be provided 2 above and 2 below each rated primary voltage (12.47KV and 7.2 KV). Operating handles for primary tap changers for de-energized operation shall be located within high-voltage compartments, externally to transformer tanks. Adjacent to the tap changer operating handle, a nameplate or equivalent stenciled inscription shall be provided and inscribed "DO NOT OPERATE UNDER LOAD." Transformer KVA ratings shall be as required, 65 degrees C temperature rise, 12.47 x 7.2 KV primary, 480Y/277 volt, 3-phase, 4-wire secondary. Transformers shall be sized with a minimum of 25% spare capacity for future growth.

9-4.20.1.4. Low-Voltage Cable Compartments: Neutrals shall be provided with fully-insulated bushings. Clamp type cable terminations, suitable for copper conductors entering from below, shall be provided as necessary.

9-4.20.1.5. Accessories: High-voltage warning signs shall be permanently attached to each side of transformer stations. Voltage warning signs shall comply with IEEE C2. Copper-faced steel or stainless steel ground connection pads shall be provided in both the high- and low-voltage compartments. Dial-type thermometer, liquid-level gauge, and drain valve with built-in sampling device shall be provided for each transformer station. Insulated-bushing-type parking stands shall be provided adjacent to each separable load-break elbow to provide for cable isolation during sectionalizing operations.

9-4.20.2. High Voltage Switches: Metal-enclosed interrupter switchgear consisting of fused, air-insulated interrupters shall be provided for protection of incoming circuits. Metal-enclosed interrupter switchgear shall comply with IEEE ANSI/IEEE C39-30 for load-interrupter switches, NEMA SG-2 for power fuses and shall be of the outdoor no aisle type that meets or exceeds the requirements of the applicable publications listed. Switch construction shall be of the manually-operated, "OPEN-CLOSED" air insulated load interrupter type equipped with a stored energy operator for quick-make quick-break to make operating speeds independent of manual switch operations. Suitable bus or lug connections shall be provided to mount slip-on medium voltage cable terminations for cable entering via conduit from below. Fuses shall be of the current limiting type. Fuses shall be sized approximately 150 percent of the transformer full load current rating. Three sets

of spare fuses (for transformer operation at 7.2 KV) shall be provided to DPW. In addition, two sets of fuses sized for transformer operation at 12.47 KV shall be provided to DPW. Identify the following switch ratings in the design and specifications:

a. nominal voltage,

b. rated maximum voltage,

c. maximum symmetrical interrupting capacity,

d. maximum asymmetrical interrupting capacity,

e. 3-second short time current carrying capacity,

f. rated continuous current, and

g. BIL.

9-4.21. Area Lighting: Area lighting shall be as indicated on RFP drawings. Area lighting shall be provided with HPS lights. Illumination levels and uniformity ratios shall be in accordance with the IES Lighting Handbook. Luminaries shall be actuated by photoelectric control, one photocell per circuit, and supplied from multiple circuits. Light fixtures shall have vandal-resistant polycarbonate type lens and shall be mounted on seamless aluminum poles. Lights, poles, and anchoring shall be designed to withstand a wind loading of 100 MPH.

9-4.22. Modifications to Existing Parking Lot Lighting: Parking lots adjacent to Building 358 and across Flagler Road from Building 356 will be modified for AT/FP clearance requirements by the removal of parking spaces and relocation of vehicle movement areas. Modify the existing lighting for those parking lots by removing existing lighting (pole lights, raceways, etc.) as necessary to accommodate new work, removing unnecessary lighting (to include associated raceways, cables, etc.) and providing new lighting, to match existing, to properly illuminate the modified parking lots. New raceways, cables, recircuiting existing lighting to remain, etc., shall be considered incidental to this work. Lighting levels and uniformity ratios shall be in accordance with the IES Lighting Handbook. Luminaries shall be actuated by photoelectric control, one photocell per circuit, and supplied from multiple circuits. Light fixtures shall have vandal resistant polycarbonate type lens and shall be mounted on seamless aluminum poles. Lights, poles, and anchoring shall be designed to withstand a wind loading of 100 MPH. Connect parking lot lighting systems to the new electrical distribution system for Quad C. Refer to RFP drawings for location.

9-4.23. ATFP Access Controls: Provide general lighting, electrical power, and signals for new ATFP access controls. Control equipment to be located in Quad C. Access control equipment and lighting shall be connected to the new electrical distribution system for Quad C. Refer to RFP drawings for locations.

9-4.24. Gear Wash/Recreational Facility: Provide general lighting and electrical power for the facility. Lighting shall be permissive switch controlled.

9-4.25. Multipurpose Court Lighting: Illumination levels and uniformity ratios shall be in accordance with IES Lighting Handbook for recreational (outdoor) classification. Lamps shall be metal halide for better color rendition. Luminaries shall be actuated by egg timer type (or parking meter type) time switches and supplied from a three-phase circuit. Light fixtures shall have vandal-resistant polycarbonate type lens and shall be mounted on seamless aluminum poles. Lights, poles, and anchoring shall be designed to withstand a wind loading of 100 MPH.

9-4.26. Site Lighting: Various signs about the site are lit. Various landscaping features about the site are lit. Branch circuiting to those existing lights shall be demolished with the existing electrical system. Provide new branch wiring to existing site lighting from the new Quad C electrical system.

9-4.27. Metering: Metering shall be provided for each building having a connected load of 250 KVA or more to permit check metering. Enclosures shall be corrosion resistant stainless steel construction with a factory applied Norwood Brown color, Federal Color No. 10045. Metering shall be connected to the Quad C DDC system for energy usage monitoring.

9-4.28. Operation and Maintenance (0 & M) Manuals: Operation and Maintenance manuals shall be provided for the secondary unit substation. Manuals shall instructions for assembly, installation, operation and maintenance, and spare parts data which provides supplier name, current cost, catalog order number, and a recommended list of spare parts to be stocked. Manuals shall also include data outlining detailed procedures for system startup and operation, and a troubleshooting guide which lists possible operational problems and corrective action to be taken. A brief description of all equipment, basic operating features, and routine maintenance requirements shall be included. Documents shall be bound in a binder marked or identified on the spine and front cover. A table of contents page shall be included and marked with pertinent contract information and contents of the manual. Tabs shall be provided to separate different types of documents, such as catalog ordering information, drawings, instructions, and spare parts data. Index sheets shall be provided for each section of the manual when warranted by the quantity of documents included under separate tabs or dividers. Six copies of these 0 & M manuals shall be submitted within 7 calendar days following the completion of tests.

**9-5 TELECOMMUNICATIONS OUTSIDE PLANT**

9-5.1. Point of Connection:

9-5.1.1. Official (Government) Telephone Service: Existing communications manhole (CMH) C3, located near the intersection of Foote and Meigs Avenues. Please refer to RFP drawings for location.

9-5.1.2. Commercial Telephone Service: Existing PBX in Building 355.

9-5.1.3. Local Area Network (LAN) Service: Existing communications manhole (CMH) C3, located near the intersection of Foote and Meigs Avenues, and existing communications manhole (CMH) C11, located in Waianea Avenues between Sudut Street and Generals Loop, near Building 212. Please refer to RFP drawings for location.

9-5.2. Infrastructure:

9-5.2.1. Provide 9-way communications ductline and manhole system from existing communications manhole (CMH) C3, located near the intersection of Foote and Meigs Avenues to the Quad C communications distribution ductline system.

9-5.2.2. Provide 4-way communications ductline and manhole system from existing communications manhole (CMH) C11, located in Waianae Avenue to the Quad C communications distribution ductline system.

9-5.2.3. Provide communications distribution ductline system within Quad C consisting of 9-way ductline and manholes.

9-5.2.4. Provide 4-way communications ductline from the Quad C communications distribution ductline system to the main communications room for each building.

9-5.2.5. Provide communications ductline from the existing PBX in Building 355 to the Quad C communications distribution ductline system. Coordinate duct requirements with DOIM.

9-5.2.6. Exterior duct requirements for routing building systems signals (fire alarm, DDC, etc.) are in addition to infrastructure duct requirements listed above.

9-5.3. The telecommunications cable and duct distribution shall be underground within the project site. The telecommunications distribution system shall be physically separated from the electrical power distribution system in accordance with the NESC. Exterior telecommunication cables shall be furnished and installed by others. All existing unused underground telecommunications ductlines, manholes, handholes, and cables shall be removed. After award of the contract, the Contractor shall coordinate with DOIM, through Mr. Edmund Takeya at 438-0189, Infrastructure management Group and Mr. Marion F, Robinson, Jr. at 438-8071 or Mr. James W. Arrowood, 438-8070 to ensure all proposals, designs, removal work, and installation requirements meets Federal and local telecommunication standards at the sole expense of the contractor. In addition, the Contractor shall coordinate with Mr. William Aiu, AT&T HITS, to ensure existing telecommunications cables are properly attended to prior to starting building renovation. This coordination shall be required again toward the end of the project to ensure telecommunications services are available at facility turn over.

9-5.4. The Contractor shall be responsible for coordinating with DOIM to ensure that what is proposed meets Federal and local PUC requirements. If any requirements are not met, the Contractor shall provide what is required at no increase to the Contract price or time of performance.

9-5.5. The Contractor is cautioned that DOIM requires drawings to be submitted which show, at a minimum, locations, routes, types, and sizes of the supporting facilities for the telecommunications system. The Contractor is also advised that DOIM and the commercial vendor may decline to review drawings which it considers inadequate in detail.

9-5.6. ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces shall be used for maintenance hole, handhole and conduit design. The underground telecommunication system design must also conform to HITS outside plant practices. Federal standards or local practices shall be the minimum requirement. Commercial vendor products may be used, if they meet or exceed the Federal Standards.

9-5.7. In addition to the requirements stated above, the following shall be provided as a minimum:

9-5.7.1. Details of conduit termination to telecommunications lines on an existing pole or maintenance hole at the point of connection (aerial to underground or underground to underground).

9-5.7.2. Sizes, quantities, type, and locations of handholes, maintenance holes and ducts with MuleTape or engineered fabric inner duct.

9-5.7.3. Termite treated, fire retardant, 21 mm (3/4 inch) void-free plywood backboards and insulated copper, #6 AWG, ground conductors shall be provided in each telecommunications room. Plywoods shall be painted with two coats of white colored, fire retardant paint on all sides and shall cover two walls. The ground conductor shall be connected to an ANSI/TIA/EIA compliant busbar in each room. Telecommunications grounding shall meet TIA/EIA-607A.

9-5.7.4. Minimum outside plant duct size shall be 103 mm (4 inches). Conduits shall be PVC, Schedule 40, encased in 76 mm (3 inches) of 235 kPa (2500 psi) concrete. Burial depth shall be, at a minimum, 600 mm (24 inches) measured from the top of the duct. At least one spare 103 mm (4 inches) conduit shall be provided for each distribution pathway. A minimum of two spare 103 mm (4 inches) conduits shall be provided for each trunking pathway. All 103 mm (4 inches) conduits shall have MuleTape installed except for those conduits supporting fiber optic cabling. These conduits shall utilize engineered fabric inner ducts. The number and thread color shall be coordinated with DOIM's Infrastructure Management Group, Fiber Optic Manager, (808) 438-8056.

9-5.7.5. Maintenance holes shall be per DOIM standards. Submit maintenance hole shop drawings to DOIM for approval prior to fabrication. Maintenance hole sketches for general guidance are in Attachment 24. Sketches are intended to provide rough hole sizes for guidance. DOIM periodically revises its standards. The Contractor shall be responsible to obtain the latest copy of DOIM standards and for ensuring that his design meets those standards. The Contractor shall design the maintenance holes, including structural design of the holes to meet ASHTO H20 loading. The Contractor shall submit structural calculations substantiating his design. Interior clear dimensions shall be maintained and shall be considered minimal. Maintenance holes shall be equipped with two pulling-in iron and cable racks with arms. Maximum spacing for maintenance holes shall be 152 m (500 feet). Maximum spacing between handholes and between handholes and buildings shall be 45.5 m (150 feet). All maintenance holes, and handholes shall be provided with 2400 mm (8 feet) ground rods. All handholes shall be located in sidewalks and all maintenance holes shall be located in roadways.

9-5.7.6. All inside and outside cabling shall be identified and tagged at the terminal, outlet, and at each termination and maintenance hole in accordance with ANSI/TIA/EIA 606A, and local numbering conventions, with the following minimum information:

a) building and floor number,

b) room and outlet designation and

c) cable pair, pair count, AWG.

9-5.7.7. The Contractor is required to follow Federal, Army and Hawaii PUC technical guidance as part of this project. Any deviations shall be coordinated through the DOIM's subject matter experts who will coordinate with local service providers. Point of contact at DOW is Mr. Edmund Takeya at 438-0189. Subject matter experts in the Infrastructure Management Group are Mr. Marion F. Robinson. Jr. at 438-8071 or Mr. James W. Arrowood at 438-8070.

## 9-6. EXTERIOR CABLE TELEVISION SYSTEM

9-6.1. Point of connection: Existing communications manhole (CMH) C3, located near the intersection of Foote and Meigs Avenues. Please refer to RFP drawings for location. CATV cables shall be included in the 9-way ductline required from existing communications manhole (CMH) C3 to Quad C described above. Additional requirements to support the CATV outside plant will be coordinated with DPW, DOIM, and the Directorate of Contracting. Depending on existing contracts and agreements, additional CATV outside plant requirements may or may not be included in the project.

9-6.2. Space provisions (empty conduits) shall be made, for installation of an underground television cable system. Cables will be furnished and installed by others. Mule tape shall be provided in all empty conduits to facilitate pulling of cables by others. The underground cable television distribution system shall be physically separated from the electrical distribution system in accordance with NESC (ANSI C2). All design

and installation requirements shall be coordinated with Oceanic Cable at the sole expense of the Contractor. The cable television system shall reside in the official telecommunications pathways and spaces except where power is required. Pathways and spaces include maintenance holes, handholes, conduits, and telecommunication rooms.

9-6.3. The Contractor is cautioned that Oceanic Cable requires drawings to be submitted which show, at a minimum locations, routes, types, and sizes of the supporting facilities for the television system. The Contractor is also advised that Oceanic Cable may decline to review drawings which it considers inadequate in detail.

9-6.4. The Contractor is advised that Oceanic Cable has standard drawings for the pull boxes, handholes and ductlines. The Contractor may contact Oceanic Cable regarding their standard specifications. The point of contact is Mr. Dean Yonezawa, Oceanic Cable, phone number (808) 625-8456.

9-6.5. The Contractor shall coordinate with Oceanic Cable to ensure what is proposed meets all of that company's requirements. If any requirements are not met, the Contractor shall provide what is required at no increase to the Contract price or time of performance.

9-6.6. The Contractor must provide 1-week notice before conduit installation begins. Point of contact shall be Mr. Moki Place, Oceanic Cable, phone number (808) 625-8378.

9-6.7. In addition to the requirements stated above, the following shall be provided for Oceanic Cable's approval.

9-6.7.1. Details of conduit termination to Oceanic Cable lines on an existing pole or manhole at the point of connection (aerial to underground or underground to underground).

9-6.7.2. Sizes, quantities, type, and locations of pullboxes, handholes, manholes, and ducts with MuleTape. May include power supply with secondary as needed.

9-6.7.3. Sizes and types of terminal cabinets required at each building. A termite treated backboard and insulated copper, #6 AWG, ground conductor shall be provided in each cabinet. The ground conductor, with 900mm (3-feet) excess length in each cabinet, shall be connected to the building grounding system. Cabinet enclosures shall be rated NEMA 3R.

9-6.7.4. Minimum duct size for distribution lines shall be 103 mm (4 inches). Ducts shall be PVC schedule 40 when concrete encased and when direct buried. If practicable, locate below the sidewalks. Burial depth shall be 600 mm (24 inches). MuleTape shall be provided in each duct. See other paragraphs for burial depth and concrete encasement requirements.

9-6.7.5. Maximum spacing of pullboxes/handholes shall be 108m (350 feet). All handholes/pullboxes shall be located in sidewalks and/or planter strips. Maximum distance for CATV service drop cables shall not exceed 45.5m (150 feet) from the Building's terminal cabinet to the pullbox containing the main CATV distribution cables. Exceptions to this requirement will require approval from Oceanic Cable.

9-6.7.6. Minimum duct size to the building shall be 53 mm (2 inches). Ducts shall be PVC Schedule 40 when concrete encased and when direct buried. Mule tape shall be provided in each empty duct.

9-6.7.7. Where applicable, sizes and locations of power supply pullbox shall be as recommended by Oceanic Cable. Power supply, box, pad, and pedestal shall be provided by Oceanic Cable.

9-6.8. Pullboxes: A 600 mm (24 inch) by 1200 mm (48 inch) CATV pullboxes shall be used for this project if necessary. Pullbox shall be in accordance with Oceanic Cable standards. Pullboxes shall be precast concrete with polymer non-skid surfaced two piece covers inscribed with "TV". A minimum of two precast concrete pullbox sections shall be required at each pullbox.

9-6.9. Terminal Cabinets. Terminal cabinets shall be provided. Incoming ducts to the building main terminal cabinet shall be 53 mm (2-inch) PVC schedule 40 when concrete encased and when direct buried.

**9-7. SPECIAL UTILITIES AND SUPPLEMENTARY CONSTRUCTION**: Required connections to the existing utilities shall be completed by the Contractor at no increase to the Contract price even if they are beyond the indicated project boundaries. The Contractor shall coordinate the installation of telephone and cable TV feeders from the points of connection to the buildings with DOIM, Oceanic Cable, Verizon and Verizon Media Ventures, respectively.

# CHAPTER 10

# HEATING, VENTILATING, AND AIR CONDITIONING

## 10-1 GENERAL REQUIREMENTS

10-1.1 **Heating, Ventilating and Air Conditioning (HVAC) scope**. The HVAC requirements for the project, as indicated in this Chapter, are generally contained within this chapter unless otherwise noted. Other HVAC scope indicated by other Chapters and the Attached Concept Design Documents (Drawings, HVAC Calculations), which are to be used for the design of this project, are subject to requirements in this section. All requirements within this Chapter shall take precedence over any conflicting requirement in other Chapters, Attachment Concept Design Documents or any other criteria and shall be brought to the attention of the Contracting Officer for resolution in writing. All definitions and acronyms used in this section are intended to be used for this section only unless otherwise noted. Catalog cuts in the attachments are not intended to be exact equipment provided. Equipment shall be similar to catalog cuts and based on design developed after award.

10-1.2 **Design Standards and Codes.** HVAC systems shall be designed and installed in accordance with Title 10 CFR Part 434, current versions of the International Mechanical Code and the references listed below.

**NON-GOVERNMENT PUBLICATIONS:**

| | |
|---|---|
| Air Movement and Control Association<br>30 W. University Drive<br>Arlington Heights, IL 60004-1893 | AMCA 210 (1985)<br>Laboratory Methods of Testing Fans for Rating |
| Air Conditioning and Refrigeration Institute<br>4301 North Fairfax Drive<br>Arlington, VA 22203 | ARI 880 (1998)<br>Air Terminals |
| American Bearing Manufacturers Association<br>1200 19th Street, NW<br>Washington, DC 20036-4303 | AFBMA Std 9 (1990)<br>Load Ratings and Fatigue Life for Ball Bearings<br>AFBMA Std 11 (1990)<br>Load Ratings and Fatigue Life for Roller Bearings |
| American Society for Testing and Materials<br>100 Bar Harbor Drive<br>West Conshohocken, PA 19428-2959 | ASTM B 88 (1999) Seamless Copper Water Tube<br>ASTM B 117 (1997) Operating Salt Spray (Fog) Apparatus<br>ASTM B 280 (1998) Seamless Copper Tube for Air Conditoning and Refrigeration Field Service<br>ASTM C 534 (1999) Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form<br>ASTM C 547 (1995) Mineral Fiber Pipe Insulation<br>ASTM C 552 (1991) Cellular Glass Thermal Insulation |

| | |
|---|---|
| | ASTM C 553 (1999), Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications. |
| | ASTM C 591 (1994) Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation |
| | ASTM C 612 (2000) Mineral Fiber Block and Board Thermal Insulation |
| | ASTM C 1126 (1998) Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation |
| | ASTM E 84 (2000)<br>Surface Burning Characteristics of Building Materials |
| American Society of Heating, Refrigerating and Air Conditioning Engineers<br><br>1791 Tully Circle. NE<br>Atlanta, GA 30329-2305 | ASHRAE 90.1 (1989; 90.1b; 90.1c; 90.1d; 90.1e; 90.1g; 90.1i 90.11-1995; 90.1m-1995; 90.1n-1997)<br>Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings |
| | ASHRAE Hdbk-IP (2001) Handbook, Fundamentals I-P Edition |
| | ASHRAE 15 (1994) Safety Code for Mechanical Referigeration |
| | ASHRAE 34 (1997) Number Designation and safety Classification of Refrigerants |
| | ASHRAE 52.1 (1992) Gravimetric and Dust-Spot Procedures for Testing Air-Cleaning Devices Used in General Ventilation for Removing Particulate Matter |
| | ASHRAE 62 (2001) Ventilation for Acceptable Indoor Air Quality |
| Associated Air Balance Council<br>1518 K Street NW, Suite 708<br>Washington, DC 20005 | AABC MN-1 (1989)<br>National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems |
| Manufacturers Standardization Society of the Valve and Fittings Industry | MSS SP-58 (1993) Pipe Hangers and Supports - Materials, Design and Manufacture |
| | MSS SP-69 (1996) Pipe Hangers and Supports - Selection and Application |
| National Environmental Balancing Bureau<br>8575 Grovemont Circle<br>Gaithersburg, MD 20877-4121 | NEBB Procedural Stds (1991)<br>Procedural Standards for Testing Adjusting Balancing of Environmental Systems |
| National Fire Protection Association<br>One Batterymarch Park<br>Quincy, MA 02269-9101 | NFPA 90A (1993)<br>Installation of Air Conditioning and Ventilating Systems |
| | NFPA 96 (2001)<br>Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations |

| | |
|---|---|
| | NFPA 255 (1996) Method of Test of Surface Burning Characteristics of Building Materials |
| Sheet Metal and Air Conditioning Contractor's National Association<br><br>PO Box 221230<br>Chantilly, VA 20153-1230 | SMACNA HVAC Duct Const Stds (1995; Addenda Nov 1997) HVAC Duct Construction Standards - Metal and Flexible |
| Underwriters Laboratories<br>333 Pfingsten Road<br>Northbrook, IL 60062-2096 | UL 181 (2002) Standard for Safety for Factory-made Air Ducts and Air Connectors |
| | UL 507 (1999) Electric Fans |
| | UL 555 (1999) Fire Dampers |
| | UL 1995 (1995; Rev thru Aug 1999) Heating and Cooling Equipment |
| Unified Facilities Guide Specification (UFGS) | Section 02555, Underground Heating/Cooling Distribution System, December 2001 |
| | Section 13080, Seismic Protection for Miscellaneous Equipment, April 1999 |
| | Section 14210A, Elevators, Electric, August 2001 |
| | Section 15070A, Seismic Protection for Mechanical Equipment, January 2002 |
| | Section 15080A, Thermal Insulation for Mechanical Systems, July 2002 |
| | Section 15181A, Chilled and Condenser Water Piping and Accessories, February 2003 |
| | Section 15182A, Refrigerant Piping, February 2003 |
| | Section 15620A, Liquid Chillers, June 2002 |
| | Section 15645A, Cooling Tower, December, 2001 |
| | Section 15652A, Cold Storage Refrigeration Systems, December 2001 |
| | Section 15700A, Unitary Heating and Cooling Equipment, December 2001 |
| | Section 15951A, Heating, Ventilating and Air Conditioning (HVAC) Control Systems, December 2001 |
| | Section 15990A, Testing, Adjusting, and Balancing of HVAC Systems, April 2003 |
| | Section 15995A, Commissioning of HVAC Systems, December 2001 |
| US Army Corps of Engineers, HQ<br>Engineering and Construction Division<br>Directorate of Military Programs<br>Washington, DC 20314-1000 | TI 800-01, Technical Instructions, Design Criteria, 20 July 1998 |
| | TI 810-32, Technical Instructions, Heating and Cooling Distribution Systems, 10 January 2002 |

**10-2 APPENDIX AND RECOMMENDATIONS.** HVAC design criteria in general that are stated in any reference, which are either in the appendix, stated as a recommendation or addressed with a "should" shall be considered to be mandatory requirements and will be incorporated into the design.

**10-3 DESIGN CALCULATIONS**

10-3.1 **Heat loss and heat gain calculations.** Heating and cooling loads shall be in accordance with the current edition of the ASHRAE Handbook of Fundamentals. Computer-generated load calculations shall be provided and shall include complete input data and output summaries. Equipment shall be sized to meet the total, sensible and latent loads determined by the computer calculation. Equipment may be oversized to no more than 15 percent of the computer generated load. For cooling load calculations, the design shall be based on the 2.5 percent weather data in TM 5-785. In addition to calculating the cooling load at maximum design temperature, cooling load calculations or thermal simulations should also be made for low load conditions to determine the greatest dehumidification load that may be encountered. The design shall maintain relative humidity in the spaces to between 35% and 65% relative humidity except as otherwise notated. Sufficient cooling shall be provided to maintain the following space temperatures.

| Type of Space* | Indoor Space Temperature (°F) | Indoor Space Temperature (°C) | Remarks |
|---|---|---|---|
| Offices, Administration, Waiting Rooms | 75 | 24 | |
| Telecom, Comm Storage, Electronic Switch Rooms | 72 | 22 | |
| Arms Vaults | 75 | 24 | Maintain relative humidity between 35% and 55% |
| Equipment Maintenance Rooms | 75 | 24 | |
| Classrooms | 75 | 24 | |
| Specialty Storage | 75 | 24 | |
| Billeting, Game Rooms | 75 | 24 | |
| Dining Room | 75 | 24 | |
| Kitchen, Dishwashing | 85 | 29 | |
| Other Air Conditioned Rooms | 75 | 24 | |
| Restrooms, Toilets, Laundry Rooms, Janitor Rooms | | | Served by transfer air, 100% exhausted to outside |
| General Storage | | | Served by transfer air, 100% exhausted to outside |

*Note: See attached calculations and drawings for rooms to be air conditioned.

10-3.1.1 **Load design criteria.** The internal loads shown in the Attached Concept Design Documents (Drawings, HVAC Calculations) shall be used in the calculations in the design after award. Calculations submitted shall include, but not be limited to, input data used in determining the computer-generated load calculations.

10-3.1.2 **Schedule.** The heating and air conditioning calculations shown in the Attached Concept

Design Documents (Drawings, HVAC Calculations) shall be used to determine zoning characteristics of the air conditioning systems.

10-3.2 **Ventilation air.** Calculations determining minimum outside ventilation air and exhaust shall be provided. Ventilation air shall be provided to each building space and shall be in accordance with the current edition of ASHRAE 62. In addition, outside air quantities shall be sufficient to maintain positive or negative pressure relative to adjacent spaces.

10-3.3 **Piping calculations.** Calculations shall be provided for pressure drop calculations for all piping systems. Water velocity through pipes shall be limited to 2440 mm/sec (8 ft/sec) unless a lower velocity is recommend by the HVAC equipment manufacturer(s). An isometric diagram of the water system shall be included in the design after award submittal.

10-3.4 **Duct calculations.** Calculations shall be provided for sizing all duct systems, including static pressure drop calculations for all fans. Air velocity through ductwork shall be limited to 7.62 m/s (1500 ft/min). Ductwork layout drawings shall be provided to indicate all fittings and devices to substantiate calculations.

10-3.5 **Outside air.** Where the outside air requirements are a significant part of the cooling load, the use of desiccant cooling, enthalpy wheels and similar devices for conditioning the outside air and transferring latent and sensible heat to the exhaust air shall be considered. Units shall be appropriately sized to eliminate or minimize the latent load in the conditioned space to save significant energy and increase the comfort level.

**10-4 MECHANICAL SYSTEMS**

10-4.1 **Air conditioning systems.** The buildings shall be provided with central air conditioning systems. Systems shall be designed, installed, balanced and adjusted to distribute cooling to all occupied spaces, server, telecommunication and computer rooms. Air conditioning systems shall have ducted supply and return air distribution as indicated.

10-4.2 **Exhaust systems.** Provide individual ceiling mounted fans for toilet exhausts. Provide individual ceiling mounted fans for general exhaust systems. Provide individual thermostatically controlled exhaust fans for laundry rooms, mechanical/electrical rooms and other spaces where ventilation only is required. Provide exhaust hoods individually and directly ducted to the exterior for all residential type ranges and cooking surfaces.

10-4.3 **Features.** Equipment provided shall have the features described below. Mechanical equipment shall be located and be of minimum capacities indicated in the Attached Concept Design Documents (Drawings, HVAC Calculations).

10-4.4 **Factory authorized supplier.** The equipment shall be furnished by a factory authorized supplier within a distance of 500 miles of the installation site.

**10-5 CENTRAL COOLING EQUIPMENT.** Minimum equipment efficiencies shall be in accordance with DOE Buying Energy Efficient Products Recommendations (refer to www.eren.doe.gov/femp/procurement for recommended efficiencies) or Energy Star. Design shall be in accordance with TI 800-01 including, but not limited to, paragraphs referring to providing multiple chillers for systems with cooling capacities over 350 kW (100 tons). Central cooling equipment shall be provided in locations indicated and with minimum capacities as indicated.

10-5.1 **Chiller.**

1. Chiller shall include the following quality characteristics.

a. Chiller performance shall be rated in accordance with ARI Standard 550.

b. Equipment and installation shall be in compliance with ANSI/ASHRAE 15.

c. Cooler and condenser shall include ASME “U” stamp and nameplate certifying compliance with ASME Section VIII, Division 1 code for unfired pressure vessels.

d. Chiller shall be manufactured in a facility that has been registered by UL to the ISO 9000 Series Standards for quality.

e. Chiller shall be designated and constructed to meet UL requirements and shall have labels appropriately affixed.

f. Each compressor assembly shall undergo a mechanical run-in test to check proper operation of components and to verify that vibration levels, oil pressures/temperatures and efficiencies are within acceptable limits. Each compressor assembly shall be pneumatically proof tested at 2792 kPa (405 psig) and leak tested with a tracer gas at 1151 kPa (225 psig).

g. Both cooler and condenser shall be proof tested at 2586 kPa (375 psig) on the refrigerant side and leak tested with a refrigerant gas at 2086 kPa (300 psig). The water side of each heat exchanger shall be hydrostatically tested at 1.5 times rated working pressure.

h. The entire chiller assembly shall be leak tested with a refrigerant tracer gas.

2. Compressor variable frequency drive (VFD) motor and controls shall have the following characteristics.

a. Input power shall be as indicated. Voltage may vary by +/- 10%. Motor base frequency shall be 60 +/- 2 Hz. Motor design speed shall be 3550 RPM. Output frequency range shall be between 65% and 100% motor speed.

b. The VFD shall be capable of 100% full load continuous output.

c. Minimum drive efficiency shall be 97% at motor base speed and rated torque. Losses shall include all control power and cooling system losses associated with the drive. Displacement power factor shall be 95% throughout the entire operating speed range as measured at the drive input terminals.

d. Fixed utility power (voltage and frequency) shall be converted to a variable voltage and frequency. The drive shall consist of three basic power sections. The first, a converter section consisting of a full-wave fixed diode bridge rectifier, shall convert incoming fixed voltage/frequency to a fixed DC voltage. The second section, a DC Link, shall filter and smooth the converted DC voltage. The third section, a transistorized inverter and control regulator, shall convert the fixed DC voltage to a sinusoidal wave, pulse width modulated (PWM) waveform.

e. The drive shall employ PWM modulation to minimize motor heating. An asynchronous carrier shall be employed to eliminate torque pulsations. Switching frequency shall be adjustable at 2, 4 or 8 kHz.

f. A DC Link reactor shall be included for each rating to minimize harmonic distortion and

maximize input power factor.

g. The drive shall be housed in a unit-mounted cabinet, formed, assembled, front accessible and braced, general-purpose indoor enclosure rated NEMA 1.

h. Enclosures shall be single bay, sheet steel with hinged access doors and a lockable, through-the-door handle operator mechanism.

i. Construction safety features shall include:

- Provisions to padlock main disconnect handle in the “OFF” position.

- Mechanical interlock to prevent opening cabinet door with disconnect in the “ON” position or moving disconnect to the “ON” position while the door is open.

- Warning signs on terminals that are energized with the power disconnect “OFF”.

j. Chiller oil pump branch fused disconnect shall be provided.

k. The operator interface shall be at the main chiller control panel. The panel shall consist of a door mounted back-lit LCD display, capable of controlling the drive and chiller settings for proper drive operation. The drive parameters will be preset in the factory using the keypad on the door of the drive.

3. Cooler and Condenser.

a. Cooler and condenser shall be of the shell and tube type construction, each in separate shells. Units shall be fabricated with high-performance tubing, steel shell and tube sheets. Waterboxes shall be nozzle-in-head type with nozzles either flanged or with grooves to allow for use of grooved couplings.

b. Tubing shall be copper, high-efficiency type, with integral internal and external enhancement.

c. Cooler and condenser shall display ASME nameplates that show pressure and temperature data and the “U” stamp for ASME Section VIII, Division 1.

d. Tubes shall be individually replaceable from either end of the heat exchanger without affecting the strength and durability of the tube sheet and without causing leakage in adjacent tubes.

4. Refrigerant Flow Control. Liquid refrigerant form the condenser shall be metered using a direct acting, float-type metering valve to maintain the proper liquid level of refrigerant in the heat exchangers under both full and part load operating conditions. By maintaining a liquid seal at the flow valve, bypassed hot has from the condenser to the cooler is eliminated. The float valve chamber shall have a bolted access cover to allow field inspection, and the float valve be field serviceable. Fixed orifices shall not be acceptable.

5. Controls. The chiller shall be provided with a factory installed and wired mircoprocessor control system with individually replaceable modular component construction. Components includes shall be the main processor/input-output module, power supply, starter management module, relay board, temperature and pressure sensors and all necessary auxiliary devices required for proper operation.

6. Control functions. The chiller controls shall be configurable for manual or automatic start-up and shutdown (scheduling). The controls shall provide the capability to view and change the leaving chilled water setpoint, entering chilled water setpoint and demand limit setpoint.

7. Safeties. Unit shall automatically shutdown when any of the following conditions occurs.

   a. Motor overcurrent
   b. Over voltage
   c. Under voltage
   d. Single cycle dropout
   e. Low evaporator refrigerant temperature
   f. High condenser pressure
   g. High motor temperature
   h. High compressor discharge temperature
   i. Low oil pressure
   j. Low oil level
   k. Loss of cooler water flow
   l. Loss of condenser water flow
   m. Start fault
   n. High oil filter differential pressure
   o. Out-of-range sensors
   p. Excessive starter transition time
   q. Motor current signal loss
   r. Motor power supply phase reversal
   s. Temperature sensor and transducer faults
   t. Single cycle dropout
   u. Motor running in reverse
   v. Motor running without control authorization

8. Insulation. Chilled water piping and cooler waterboxes shall be insulated.

9. Vibration isolation. Chiller shall be mounted on factory provided spring isolators.

10. Motors. Three phase motors of 1 HP or larger shall be premium efficiency electric motors. Motors shall have TEFC type enclosures.

10-5.1.1 **Hermetic screw liquid chiller.** Microprocessor-controlled liquid chiller using a twin rotor, direct drive, semi-hermetic, screw compressor.

1. Compressor.

   a. One positive displacement field-serviceable helical, rotary, semi-hermetic, twin rotor-type compressor. Compressor section joints shall be sealed using O-rings instead of gaskets to reduce the occurrence of refrigerant leakage.

   b. The compressor casing shall be cast-iron with design pressure rating of 2068 kPa (300 psig) or higher.

   c. Bearings shall be pressure lubricated rolling element type, AFBMA Class 5 or superior.

   d. Discharge oil separation shall be accomplished external to the compressor casing. Oil separator and return system shall be designed to ensure that oil is adequately returned to the compressor and does not collect in the heat exchangers.

e. Compressor safeties shall include high compressor discharge temperature, high motor winding temperature, low oil pressure, reverse rotation and high discharge pressure.

f. Compressor shall be equipped with internal pressure relief to protect against overpressure. For compressors not equipped with internal pressure relief, the high side of the chiller shall be protected with an external relief valve capable of passing the full load flow produced by the compressor.

g. Compressor shall be provided with a lubrication system to deliver oil under pressure to the bearings.

h. Compressor shall be fully field serviceable. Compressors which must be removed and returned to the factory for service shall not be acceptable.

2. Capacity control. Capacity control shall be by means for hydraulically operated slide valve under the compressor rotors. Load modulation shall be from 100% to 10% of compressor full load under normal ARI conditions without the use of hot gas bypass. The slide valve shall be precisely positioned by a proportional-integral-derivative (PID) control algorithm to ensure precise control of desired chilled water temperature without hunting or overshooting the setpoint.

10-5.1.2 **Hermetic centrifugal liquid chiller.** Microprocessor-controlled liquid chiller using a single stage, semi-hermetic, centrifugal compressor.

1. Compressor.

a. Impeller shall be open type with machined shroud contours.

b. Compressor, motor and transmission shall be hermetically sealed into a common assembly and arranged for easy field servicing. Internal compressor parts shall be accessible for servicing without removing the compressor base from the chiller. Connections to the compressor casing shall use O-rings instead of gaskets to reduce the occurrence of leakage. Connections to the compressor shall be flanged or bolted for easy disassembly.

c. Journal bearings shall be of the steel-backed, Babbitt lined type or roller element bearings.

d. Transmission shall be single ratio, single helical, parallel shaft speed increaser. Gears shall conform to AGMA Standards, Quality II.

e. Compressor shall be provided with a lubrication system to deliver oil under pressure to the bearings.

f. Compressor shall be fully field serviceable. Compressors which must be removed and returned to the factory for service shall not be acceptable.

2. Capacity control. Capacity control shall be by means of variable inlet guide vanes located at the impeller inlet. Load modulation shall be from 100% to 15% of compressor full load under normal ARI conditions without the use of hot gas bypass. The guide vanes are precisely positioned by a PID (proportional-integral-derivative) control algorithm to ensure precise control of desired chilled water temperature without hunting or overshooting the setpoint.

10-5.2 **Cooling Towers.** Towers shall be the induced mechanical draft type and shall be certified by the Cooling Tower Institute (CTI). Towers shall be factory fabricated and assembled, shipped to the job site in separate cells or modules and shall be provided with all appropriate manufacturer's hardware for assembly in the field. Towers shall be assembled and adjusted at the job site by a factory representative.

1. Framework, Casing, Supports and Foundation.

   a. Towers shall be designed and constructed to withstand a wind pressure of not less than indicated in the IBC. Framework, structural supports and equipment supports shall be Type 304 stainless steel. Casing shall be constructed of Type 304 stainless steel.

   b. Foundations shall meet the requirements of the cooling tower manufacturer and be seismically designed in accordance with the IBC. Foundation design shall be based on the load calculations and the soil bearing value indicated. Foundation calculations shall be submitted with the equipment drawings.

2. Stairways and Ladders. Provide stairs, 60 degree ship ladders or straight-rung ladders of standard design, starting at ground level or at roof level, if the roof is accessible, and extending as high as required to gain access to fan decks and water distribution systems. Stairways and ladders shall be hot-dipped, zinc-coated steel. Ladders higher than 3.66 meters (12 feet) shall have a safety cage.

3. Handrailings. Steel handrailings shall be not less than 1067 mm (42 inches) high around the exterior of each working surface that is 3.66 meters (12 feet) or more above the ground, roof, or other supporting construction. Railings shall not be smaller than 32 mm (1-1/4 inch) zinc-coated steel pipe with standard zinc-coated steel railing.

4. Access doors. Each tower shall be provided with access doors at grade or roof level, if the roof is accessible, to provide entry to the interior for service maintenance without removal of the fill. Doors shall be provided on each endwall of each cooling tower cell. Frame and brace access doors to prevent damage when opening and closing. Doors shall be located adjacent to float controls.

5. Louvers. Air inlets for each cooling tower shall be provided with individually removable louvers arranged to prevent the escape of water. Louvers shall be Type 304 stainless steel. Materials provided for casings and louvers shall be compatible; one material shall not produce stains upon the other. Air intakes shall be provided with 25 mm (1 inch) zinc-coated steel mesh.

6. Fan deck and cylinder. Each fan shall be mounted in a fan cylinder (or stack) to elevate the fan discharge air. Total extension height shall not exceed the fan diameter. Each fan cylinder shall be provided with a zinc-coated steel 2.75 mm (12 gauge) wire mesh securely mounted to the top of the cylinder in accordance with manufacturer's recommendations. Fan decks shall be designed to withstand a live load of not less than 1.9 kPa (40 psf) in addition to the concentrated or distributed loads of equipment mounted on the fan decks. Fan deck and cylinders shall be constructed of Type 304 stainless steel and be compatible with the entire tower construction.

7. Fans shall be propeller type, constructed of Type 304 stainless steel. Fans shall be variable speed or 2-speed. Variable speed drives shall be as specified in paragraph 10.6 Air Distribution. Propeller type shall have a maximum tip speed of 55 m/s (11,000 fpm). Fan blade assembly shall be both statically and dynamically balanced after assembly of the

cooling tower. Fan hub shall be constructed of stainless steel. Complete fan assembly (fan and mounting) shall be designed to give maximum fan efficiency and long life when handling saturated air at high velocities. Each cooling tower fan shall be provided with a ball and pedestal type vibration limit switch which shall stop the corresponding fan motor in the event of sensing excessive fan vibration.

8. Speed reducer gears and drive shaft. Speed reducer gears shall be rated in accordance with CTI Std-111. Gear reducers shall be of the spiral bevel, single reduction, spiral or helical, double reduction type. Reducer shall be mounted in accordance with manufacturer's recommendations. Each reducer shall be provided with an oil level cutoff switch interlocked to the fan motor. Each reducer shall be provided with an oil level sight glass, fill, drain and vent lines located in a readily accessible position. Drive shafts shall be the full floating type with flexible couplings at both ends and have a service factor of 1.0 or greater. Drive shafts shall be of stainless steel, fitted each end with flexible coupling (stainless steel plate type). Each drive shaft shall be provided with a galvanized steel guard, to prevent damage to surrounding equipment in case of shaft failure. Provision shall be made for lubrication of all bearings. Bearings shall be accessible to the extent that each bearing can be lubricated without dismantling the fan.

9. Fan motors. Each motor shall be single speed, totally enclosed, insulation Class B, NEMA Design B, continuous-rated type which conforms to NEMA MG 1. Fan motors shall have totally enclosed enclosures and be located outside the discharge airstream. Motors shall be mounted according to manufacturer's recommendations. Motors of 1 HP or greater shall be premium efficiency. Motors shall have TEFC type enclosures.

10. Hardware. Bolts shall be Type 304 stainless steel. Each bolt shall be provided with neoprene and cadmium-plated steel washers under the heads. Nails shall be stainless steel. Hardware shall meet the salt-spray fog test as defined by ASTM B 117.

11. Cold water basin. Basin shall be completely watertight and constructed of Type 304 stainless steel. Basin shall be constructed and installed to ensure that air will not be entrained in outlets when operating and no water will overflow on shutdown. Each individual sump shall be provided with an individual outlet. Each outlet shall be provided with a 1/2 inch mesh, zinc-coated steel wire securely mounted to prevent rash from entering the outlet. Each basin shall be provided with overflow and valved drain connections. Each basin shall be provided with a float-controlled, makeup water valve. The makeup water shall discharge not less than 50 mm (2 inches) or two pipe diameters, whichever is greater, above the top of the basin.

12. Water distribution system. Water distribution shall be the gravity-flow type system which distributes water evenly over the entire fill surface. Each tower cell shall be designed so that a water flow of 140 percent capacity will not cause overflowing or splashing. The distribution system for each cell shall include adjustable flow control valves. The entire distribution system shall be self-draining and nonclogging. Piping shall be either cast iron, ductile iron, threaded-glass-fiber reinforced epoxy pipe, polypropylene, or Schedule 80 black steel. System shall be provided with open basins which includes a splash box or baffles to minimize splashing of incoming water and holes or spray nozzles that evenly distribute the water over the entire decking areas. Holes shall be provided with ceramic or plastic orifice inserts. Spray nozzles shall be stainless steel, bronze or polypropylene. Nozzles shall be cleanable, nonclogging, removable and spaced for even distribution.

13. Drift eliminators. Eliminators shall be provided to limit drift loss to not over 0.005 percent of the circulating water rate.

14. Fill. Tower fill shall be splash or film, type. Fill material shall be free to expand or contract without warping or cracking. No plasticized wood cellulose shall be provided for fill material. Fill shall be removable or otherwise made accessible for cleaning. Space supports shall be stainless steel and shall prevent warping, sagging, misalignment or vibration of the fill material. Fill material and supports shall be designed to provide for an even mixing of air and water. Fill material shall be constructed of aluminum, stainless steel, tile of multi-cell set without mortar or zinc-coated steel. Fill shall conform to UFGS.

15. Noise control. Sound power level data for the cooling tower shall be based on tests conducted in accordance with ANSI S1.13. Provide noise control to meet maximum sound level indicated.

10-5.3 **Pumps.** Pumps shall be electrically driven, non-overloading, centrifugal type which conform to HI 1.1-1.5. Pump shall have sufficient capacity and selected based on the design after award. Pumps shall be selected at or within 5 percent of peak efficiency. Pump curve shall rise continuously from maximum capacity to shutoff. Pump motor shall conform to NEMA MG 1 and have sufficient wattage (horsepower) to be non-overloading at any point on the pump curve. Three phase motors of one 1 HP or greater shall be premium efficiency. Motors shall have TEFC type enclosures. Pump motor shall be equipped with an across-the-line magnetic controller in a NEMA rated enclosure appropriate for environment located. Enclosure shall have a “HAND-OFF-AUTO” switch in the cover. Pump speed shall not exceed 1,750 rpm. Pump shall be accessible for servicing without disturbing piping connections. A wye or basket strainer shall be provided at the inlet of each pump. A check valve shall be provided at the outlet of each pump. Provide a standby chilled water pump and standby condenser water pump for each chilled water plant that has these pumps. This will provide redundancy in case one pump is out for either system.

10-5.3.1 **Construction.** Shaft seal shall be mechanical-seal type. Impeller shall be statically and dynamically balanced. Each pump casing shall be designed to withstand the discharge head specified plus the static head on the system plus 50 percent of the total, but not less than 862 kPa (125 psig). Pump casing shall be close grained cast iron. High points in the casing shall be provided with manual air vents; low points shall be provided with drain plugs. Impeller, impeller wearing rings, glands, casing wear rings an shaft sleeve shall be bronze. Shaft shall be carbon or alloy steel, turned and ground. Bearings shall be ball-bearings, roller-bearings, or oil-lubricated bronze-sleeve type bearings and be efficiently sealed or isolated to prevent loss of oil or entrance of dirt or water. Pump and motor shall be mounted on a common cast iron or steel “bent-frame” base. Pump and motor shall be standard coupled. C-face, close-coupled or any non-standard coupling will not be allowed.

10-5.3.2 **Mechanical Shaft Seals.** Seals shall be single, inside mounted, en-face-elastomer bellows type with stainless steel spring, brass or stainless steel seal head, carbon rotating face and tungsten carbide or ceramic sealing face. Glands shall be bronze and of the water-flush design to provide lubrication flush across the face of the seal. Bypass line from pump discharge to flush connection in gland shall be provided, with filter or cyclone separator in line.

## 10-6 AIR DISTRIBUTION SYSTEMS

10-6.1 **Air handling units.** Units shall include fans, coils, airtight insulated casing, adjustable V-belt drives, belt guards for externally mounted motors, access sections for maintenance, combination sectional filter mixing box, internal vibration isolators and appurtenances required for required operation. Air handling unit shall be provided with continuous high output ultraviolet (UV) lamps on the downstream side of the cooling coil for improved air quality. Air handling unit shall have published ratings based on tests performed according to ARI 430. All sections shall be double walled, constructed of a minimum 18 gauge galvanized steel and 50 mm (2 inch) thick insulation. Casing shall be designed and constructed with an integral structural steel frame such that exterior panels are non-load bearing. Casing shall be provided with inspection doors, access sections and access doors. Inspection and access doors shall be insulated, fully gasketed, double-wall type, of a minimum 18 gauge outer and 20 gauge inner panels. Drain pans shall be

constructed water tight, treated to prevent corrosion and designed for positive condensate drainage. Coils shall be fin-and-tube type constructed of seamless copper tubes and copper fins mechanically bonded or soldered to the tubes. Cooling coils shall have a maximum of 315 fins/m (8 fins/inch) to allow for easy cleaning, and shall be sized for a maximum face velocity of 2.8 m/s (550 fpm) to preclude moisture carryover. Coils shall be rated and certified according to ARI 410. Filters shall be listed according to the requirements of UL 900. Filters shall be 50 mm (2 inch) depth, sectional, disposable type of the size indicated and shall have an average efficiency of 25 to 30 percent when tested according to ASHRAE 52.1. Filters shall be UL Class 2. Air handling units with multiple fans shall be double-inlet, centrifugal or plug type with each fan in a separate scroll. Fan bearings shall be sealed against dust and dirt and shall be precision self-aligning ball or roller type. Bearing life shall be L50 rated at not less than 200,000 hours as defined by AFBMA Std 9 and accessible at the drive side of the unit. Motor shall be of sufficient size to be non-overloading at any point on the fan curve and shall be premium efficiency. Motor enclosures shall be of the totally enclosed type. Motor shall be equipped with an across-the-line magnetic controller in a NEMA 250 rated enclosure, appropriate for its location, with a “HAND-OFF-AUTO” switch in the cover. Provide constant speed or variable speed motors as indicated. Motors shall be non-overloading on any point of the fan curve.

Provide duct mounted dial thermometer (0°F to 100°F) in the supply air duct of each air handling unit so that maintenance personnel can check the supply air temperature to see if the unit is operating properly.

Variable frequency drive (VFD) motor and controls shall have the following characteristics.

1. Input power shall be as indicated. Voltage may vary by +/- 10%. Motor base frequency shall be 60 +/- 2 Hz. Motor design speed shall be 3550 RPM. Output frequency range shall be between 65% and 100% motor speed.

2. The VFD shall be capable of 100% full load continuous output.

3. Minimum drive efficiency shall be 97% at motor base speed and rated torque. Losses shall include all control power and cooling system losses associated with the drive. Displacement power factor shall be 95% throughout the entire operating speed range as measured at the drive input terminals.

4. Fixed utility power (voltage and frequency) shall be converted to a variable voltage and frequency. The drive shall consist of three basic power sections. The first, a converter section consisting of a full-wave fixed diode bridge rectifier, shall convert incoming fixed voltage/frequency to a fixed DC voltage. The second section, a DC Link, shall filter and smooth the converted DC voltage. The third section, a transistorized inverter and control regulator, shall convert the fixed DC voltage to a sinusoidal wave, pulse width modulated (PWM) waveform.

5. The drive shall employ PWM modulation to minimize motor heating. An asynchronous carrier shall be employed to eliminate torque pulsations. Switching frequency shall be adjustable at 2, 4 or 8 kHz.

6. A DC Link reactor shall be included for each rating to minimize harmonic distortion and maximize input power factor.

7. The drive shall be housed in a unit-mounted cabinet, formed, assembled, front accessible and braced, NEMA rated enclosure appropriate for its location.

8. Enclosures shall be single bay, sheet steel with hinged access doors and a lockable, through-the-door handle operator mechanism.

9. Construction safety features shall include:

    a. Provisions to padlock main disconnect handle in the “OFF” position.

    b. Mechanical interlock to prevent opening cabinet door with disconnect in the “ON” position or moving disconnect to the “ON” position while the door is open.

    c. Warning signs on terminals that are energized with the power disconnect “OFF”.

10. The operator interface panel shall consist of a door mounted back-lit LCD display, capable of controlling the drive and air distribution system settings for proper drive operation. The drive parameters will be preset in the factory using the keypad on the door of the drive.

10-6.2 **Terminal units.** Variable air volume (VAV) boxes shall be certified under the ARI Standard 880-94 Certification program and carry the ARI seal. The VAV box casing shall be minimum 22 gauge galvanized steel, internally lined with 1/2 inch dual density glass fiber insulation which complies with UL 181 and NFPA 90A. All exposed insulation edges shall be coated with NFPA 90A approved sealant to prevent entrainment of fibers into the airstream. The discharge connection shall be slip and drive construction for attachment to metal ductwork. The damper shall be fabricated from heavy gauge steel with the shaft rotating in bronze self-lubricating bearings. Nylon bearings are not acceptable. VAV box shall have a multi-point, center averaging velocity sensor. Sensor shall provide control signal accuracy of +/-5%. Control shall be pressure independent, analog electric type. All controls shall be installed in an attached NEMA 1 enclosure.

10-6.3 **Fans.** Fans shall be provided in accordance with UFGS. V-belt drives shall be designed for not less than 150 percent of the connected driving capacity. Motors shall not exceed 1800 rpm. Fans shall be belt-driven or provided with speed controllers for direct-drive fans. Three phase motors of 1 HP or larger shall be premium efficiency electric motors. Motors exposed to the weather shall have totally enclosed type enclosures.

10-6.4 **Ductwork.** Provide duct systems conforming to UFGS and to the recommendations of the SMACNA Duct Construction Standards including seal class requirements. Fire and smoke dampers and smoke detectors shall be provided where required by code. Balancing dampers shall be provided at all branch takeoffs and for all air devices. Provide permanent access to dampers through concealed actuators, through access panels or through accessible ceilings (i.e. T-bar). Internally lined ductwork shall not be allowed. Pressure sensitive tape shall not be used as a sealant.

10-6.4.1 Flexible ductwork shall be limited to runouts, shall be adequately supported to prevent kinks and shall not exceed 3.2 m (10 feet) in length. Runouts shall be pre-insulated, factory fabricated and conform with NFPA 90 and UL 181.

10-6.4.2 Ducts conveying grease laden air shall be in accordance with NFPA 96 and be constructed of stainless steel. Access panels shall be provided as required by code.

10-6.5 **Supply diffusers and registers.** Diffusers shall be located to ensure that the air distribution will completely cover all surfaces of exterior walls with a blanket of conditioned air or may be of a compact design so long as “dead spots” within air conditioned spaces are avoided. At least one diffuser shall be provided in each habitable room. Diffusers shall be provided with integral opposed bladed damper. Diffusers shall be provided with air deflectors as required for proper air flow in the space. Diffusers shall be aluminum. Core velocity shall be limited to 3 m/sec (600 fpm) maximum, with a maximum pressure drop of 0.82 Pa/m (0.1 inch water gauge). Ceiling mounted units shall have factory finish to match ceiling color, and shall be installed with rims tight against ceiling. Sponge-rubber gaskets shall be provided between ceiling or wall and surface-mounted diffusers for air leakage control. Diffuser boots shall be sealed tight to the wall or ceiling they penetrate using duct mastic or caulking. Suitable trim shall be provided for flush-mounted

diffusers. Duct collar connecting the duct to the diffuser shall be airtight and shall not interfere with the volume controller. Wall supply registers shall be installed atleast 150 mm (6 inches) below the ceiling.

10-6.6 **Transfer, return and exhaust registers and grilles.** Grilles shall be fixed horizontal or vertical louver type similar in appearance to the supply diffuser face. Registers shall be provided with integral opposed blade dampers. Registers shall be aluminum. Core velocity shall be limited to 2 m/sec (400 fpm) maximum, with a maximum pressure drop of 0.5 Pa/m (0.06 inch water gauge). Grilles shall be provided with sponge-rubber gasket between flanges and wall or ceiling. Register/grille boots shall be sealed tight to the wall or ceiling they penetrate using duct mastic or caulking. Wall return grilles shall be located atleast 150 mm (6 inches) above the floor or below the ceiling.

10-6.7 **Fire dampers.** Fire dampers shall be located and installed in accordance with NFPA requirements, and shall conform to the requirements of UL 555. Fire dampers shall be automatic operating, and shall be rated for the maximum system velocity and pressure. Fire dampers shall be equipped with a steel sleeve or adequately sized frame installed in such a manner that disruption of the attached ductwork, if any, will not impair the operation of the damper. Damper shall not reduce the duct or the air transfer opening cross-section area. Access doors shall be provided at all fire dampers.

10-6.8 **Smoke dampers.** Smoke damper and actuator assembly required per NFPA 90A shall meet the Class II leakage requirements of UL 555S. Dampers shall be rated not less than 10 m/s (2000 fpm) air velocity.

10-6.9 **Duct smoke detectors.** Duct smoke detectors shall conform to the requirements of UL 268A. Duct smoke detectors shall have perforated sampling tubes extended into the air duct. Detector circuitry shall be mounted in a metallic enclosure exterior to the duct. Detectors shall have manual reset. Detectors shall be rated for air velocities that include air flows between 2.5 and 20 m/s (500 and 400 fpm). Detectors shall be powered from the HVAC control panel. At minimum, detectors shall have two sets of normally open alarm contracts and two sets of normally closed alarm contacts. Detectors shall be connected to the building fire alarm panel for alarm initiation. A removable annunciation lamp and accessible removable reset switch shall be provided for duct detectors that are mounted eight feet or more above the finished floor and for detectors that are not readily visible.

10-6.10 **Access doors.** Provide in ductwork and plenums at all air flow measuring devices, automatic dampers, fire dampers, coils, thermostats and other devices requiring service and inspection.

10-6.11 **Exterior penetrations.** Outside air intakes and exhaust penetrations through the building envelope, excluding the roof, shall be located in existing building openings (i.e. window openings) and be of minimum sizes indicated on the plans. These penetrations shall be provided with louvers of sufficient free area to prevent water from passing through the building envelope. Details including size, location and appearance shall be included in the design submittal for Government approval.

10-6.12 **Roof penetrations.** Roof penetrations shall be as indicated on the attached drawings. Details including size, location and appearance shall be included in the design submittal for Government approval.

## 10-7 PIPING SYSTEMS

10-7.1 **Piping systems.** System design, component selection and system installation, including pressure containing parts and material, shall be based upon a minimum service pressure of 862 kPa at 66 degrees C (125 psi at 150 degrees F); minimum ANSI Class 125. Condenser and chilled water piping shall be steel pipe, with the exception that piping 100 mm (4 inches) and smaller may be copper tubing.

1. Steel pipe shall conform to ASTM A 53/A 53M, Schedule 40, Type E or S, Grades A or B. Type F pipe shall not be used.

2. Copper pipe shall conform to ASTM B 88, Type K or L.

10-7.1.2 **Casing.** Polyvinyl Chloride (PVC) casings shall conform to ASTM D 1784, Class 12454-B with a minimum thickness equal to the greater of 1/100 the diameter of the casing or 1.50 mm.

10-7.1.3 **Condensate drain pipe.** Condensate drain pipe shall be copper tubing, Type L. Pipe size shall be 25 mm (1 inch) for drains serving one piece of air handling equipment and 40 mm (1-1/2 inch) for drains serving multiple pieces of air handling equipment.

10-7.2 **Water treatment.** Provide water treatment based on the attached water analysis report in accordance with UFGS to mitigate corrosion and scale and to prevent biological growth in the condenser water and chilled water systems.

10-7.3 **Makeup water.** Provide a water pressure reducing valve with pressure gauge at the chilled water makeup point of connection. Pressure gauge shall be located downstream of the pressure reducing valve.

## 10-8 INSULATION

### 10-8.1 Pipe Insulation

1. Aboveground cold pipe except condensate drains. Provide cellular glass type insulation, ASTM C 552, Type II, and Type III in accordance with UFGS.

2. Aboveground condensate drains. Provide flexible elastomeric cellular insulation, ASTM C 534, Type I or II in accordance with UFGS.

3. Aboveground hot pipe. Provide mineral fiber type insulation, ASTM C 547, in accordance with UFGS.

4. Below ground cold and hot pipe. Provide prefabricated insulated pipe and fittings. Foam insulation for prefabricated insulated pipe and fittings shall be polyurethane foam meeting the requirements of ASTM C 591 having a density of not less than 32 kg per cubic meter (2 pcf). Carrier pipe shall be metallic as indicated in paragraph 10.7 Piping Systems.

10-8.2 **Duct Insulation.** Duct insulation shall be limited to the following and shall be installed in accordance with UFGS.

1. Rigid Mineral Fiber, ASTM C 612, Type IA, IB, II, III and IV.

2. Flexible Mineral Fiber, ASTM 553, Type I or Type II up to 121 degrees C (250 degrees F). ASTM C1290 Type III.

## 10-9 INSTRUMENTATION AND CONTROLS

All pressure gauges and thermometers exposed to the weather shall have either a stainless steel casing, aluminum casing with an epoxy coating, or chrome plated brass case with stainless steel ring and be weatherproof. All electrical panels exposed to weather shall be NEMA 4X type.

A pressure gauge and thermometer shall be provided at the inlet and discharge of each chiller, pump, air handling unit and fan coil unit.

Motor control centers (MCC's) shall be provided with reverse phase and phase failure relay to detect phase unbalance or reverse phase condition. Upon detection of 10% phase unbalance or a reverse phase

condition, all motors shall stop, an audible alarm activated and green pilot light de-energized Provide a green pilot light located on the starter labeled “Power Normal”. This panel is not required for starters with internal; phase monitor.

Individual barracks sleeping rooms shall be provided with individual room temperature control.

Control system shall be direct digital control (DDC). Provide all devices required, including current transducers, transformer, thermostats, sensors, controllers, actuators, control valves, dampers, transmitters, flow meters, etc., to provide a complete and operable system. All equipment and systems shall be automatically controlled by the control system. Written and posted control system instructions shall be provided for each system. The instructions shall include half-size laminated drawings and shall include the control system schematic, equipment schedule, ladder diagram, sequence of operation, panel arrangement drawings, wiring diagram, and valve and damper schedules. Building controllers shall be fully BACNET compatible and be expandable to be able to tie into a central DDC building and energy management system at DPW HQ. Points shall include, at minimum:

1. Central Plant (includes chillers, cooling towers, pumps, hot water plant)

   Chiller on/off (each chiller)
   Chiller status (each chiller)
   Flow switch
   Load limit startup/pull down
   Chilled water temperature reset
   Chilled water supply temperature
   Chilled water return temperature
   Chilled water supply setpoint temperature
   Condenser water supply temperature
   Condenser water return temperature
   Condenser water supply setpoint temperature
   Hot water supply temperature
   Hot water return temperature
   Hot water supply setpoint temperature
   Cooling tower fan on/off (each fan)
   Cooling tower fan speed (for multi-speed fans)
   Cooling tower fan status (each fan)
   Pump on/off (each pump)
   Pump status (each pump)
   Flow alarm – no chilled water flow.
   Flow alarm – no condenser water flow.

2. Air handling units

   Fan on/off
   Fan status – differential pressure sensor
   Fan speed (for VFD AHU’s)
   Fan high static limit switch
   Filter status – differential pressure sensor
   Chilled water control valve position
   Supply air temperature
   Supply air temperature setpoint
   Supply air duct pressure (for VFD AHU’s)
   Supply air duct pressure setpoint (for VFD AHU’s)
   Return air temperature (for non-VFD AHU’s)
   Return air temperature setpoint (for non-VFD AHU’s)

Alarm – high supply air duct pressure
Alarm – power phase failure
Alarm – smoke detector (for AHU's requiring smoke detectors)

3. Variable Air Volume Boxes (through VAV unit controller)

   Room temperature sensor
   VAV box on/off
   VAV box actuator
   VAV box damper position
   VAV box max CFM setpoint
   VAV box min CFM setpoint
   VAV box CFM
   Room temperature setpoint
   Room temperature readout

4. Fans

   Fan on/off
   Fan status – current sensor

**10-10 TESTING, ADJUSTING AND BALANCING.** Testing, adjusting and balancing of each system shall be the Contractor's responsibility. Testing and balancing of the air and hydronic systems shall be accomplished by a firm certified for testing and balancing by the Associated Air Balance Council (AABC) or National Environmental Balancing Bureau (NEBB). Prior to testing, adjusting, and balancing, the Contractor shall verify that the systems have been properly installed and are operating as specified. Testing of individual items of equipment shall be performed by a person authorized to perform such testing and startup by the equipment manufacturer. The contractor shall correct all systems and equipment not found in compliance, and shall be responsible for all labor and materials required for this effort. AABC MN-1, NEBB-01, SMANCA-07 or ASHRAE 111 shall be used as the standard for providing testing of air and water systems. The selected standard shall be used throughout the entire project. All recommendations and suggested practices contained in the selected standard shall be considered mandatory. Instrumentation accuracy shall be in accordance with selected standard.

10-10.1 **Piping systems.** Each piping system including pipe, valves, fittings and equipment shall be hydrostatically tested and proved tight at a pressure of 1-1/2 times the design working pressure, but not less than 699 kPa (100 psi) for a period of not less than two hours with no appreciable loss in pressure. Piping shall not be insulated until testing is completed and acceptable. Upon completion of installation and prior to startup, each hydronic system shall be balanced. All balancing data, including deficiencies encountered and corrective action taken, shall be recorded. Following final acceptance of certified reports by the Contracting Officer, the setting of all HVAC adjustment devices shall be permanently marked by the Contractor's balancing engineer so that adjustment can be restored if disturbed at any time.

10-10.2 **Equipment.** Each item of central operating equipment provided, including air handling units shall be tested in accordance with the equipment manufacturer's standard testing procedures. A factory representative shall be present for the startup and testing of each item of equipment. A certified report shall be provided for each item of equipment tested.

**10-11 COMMISSIONING.** All HVAC systems and equipment including controls shall be commissioned in accordance with the UFGS and ASHRAE Guideline 1.

**10-12 TRAINING.** The Contractor shall conduct a training course for the operating for all HVAC operating systems and individual items of equipment. The field instructions shall cover all the items of equipment provided as well as the overall systems. The training period shall consist of a total of 40 hours of

normal working time and shall start after the systems are functionally completed and testing, adjusting and balancing have been completed. Training shall also include a minimum of two days on-site training. Factory representatives shall be present to assist in training for every item of operating equipment provided. Contractor shall provide eight copies of operation and maintenance instructions for each item of equipment provided. Training shall consist of startup, normal operation and shutdown, as well as demonstrations of routine maintenance operations. The Contracting Officer shall be notified at least 14 days prior to date of proposed conduction of the training course.

# CHAPTER 11
# ENERGY CONSERVATION

## 11-1. ENERGY RECOVERY EQUIPMENT.

11-1.1. **Heat recovery coils.** Coil assembly shall be factory fabricated and tested air-to-liquid-to-air energy recovery system for transfer of sensible heat from exhaust air to supply air stream. System shall deliver an energy transfer effectiveness without cross-contamination with maximum energy recovery at minimum life cycle cost. Components shall be computer optimized for capacity, effectiveness, number of coil fins per inch, number of coil rows, flow rate and frost control. Coils, pumps, controls and piping materials shall conform to Chapter 10 – Heating, Ventilating, and Air Conditioning.

11-1.2. **Heat pipe.** Device shall be a factory fabricated, assembled and tested, counterflow arrangement, air-to-air heat exchanger for transfer of sensible heat between return and supply streams or outside air and supply air streams. Device shall deliver an energy transfer effectiveness without cross-contamination. Heat exchanger tube core shall be seamless aluminum or copper tube with extended surfaces, utilizing wrought aluminum Alloy 3003 or Alloy 5052, temper to suit. Tubes shall be fitted with internal capillary wick, filled with an ASHRAE 15, Group 1 refrigerant working fluid, selected for system design temperature range, and hermetically sealed. Heat exchanger frame shall be constructed of not less than 16 gauge galvanized steel and fitted with intermediate tube supports, and flange connections. Tube end-covers and a partition of galvanized steel to separate exhaust and supply air streams without cross-contamination and in required area ratio shall be provided. A drain pan constructed of welded Type 300 series stainless steel shall be provided. Heat recovery regulation shall be provided. Coil shall be fitted with pleated flexible connectors.

11-1.3 **Heat recovery.** Heat recovery from the air conditioning system shall be provided. Heat recovery shall be a complete and usable system to include heat recovery unit, heat exchangers, storage tanks and pumps. Recovered waste heat from the air conditioning system shall supplement the hot water system in generating domestic hot water. Equipment, piping and appurtenances shall conform to Chapter 8 - Plumbing and Chapter 10 - HVAC.

# CHAPTER 12

# FIRE PROTECTION

## 12-1 GENERAL REQUIREMENTS

12-1.1. **Fire Protection scope.** The fire protection requirements for the project, as indicated in this Chapter, are generally contained within this chapter unless otherwise noted. Other fire protection scope indicated by other Chapters and the Attachment Concept Design Documents (Drawings, Fire Protection Analysis), which are to be used for the design of this project, are subject to requirements within this section. All requirements within this Chapter shall take precedence over any conflicting requirement in other Chapters, Attachment Concept Design Documents or any other criteria and shall be brought to the attention of the Contracting Officer for resolution in writing. All definitions and acronyms used in this section are intended to be used for this section only unless otherwise noted. All installed materials and equipment are in general to be listed by an independent laboratory such as Underwriters Laboratory. Catalog cuts in the attachments are not intended to be exact equipment provided. Equipment shall be similar to catalog cuts and based on design developed after award.

12-1.2. **Design Standards and Codes.** The design of this project shall be in accordance with the design standard and codes stated within this paragraph. The following list is not complete. Other applicable references are to be used when required by other Chapters and other references used within these standards and codes.

12-1.2.1. UFC 3-600-01 (UFC), Design Fire Protection Engineering for Facilities, 2003 edition.

12-1.2.2. International Building Code (IBC) 2000 edition.

12-1.2.3. NFPA 10, Portable Fire Extinguishers, 2002 edition.

12-1.2.4. NFPA 13 (FSC), Installation of Sprinkler Systems, 2002 edition.

12-1.2.5. NFPA 13R, Standard for the Installation of Sprinkler Systems in Residential Occupancies up to and including Four Stories in Height, 2002

12-1.2.6. NFPA 17A, Wet Chemical Extinguishing Systems, 2002.

12-1.2.7. NFPA 20, Stationary Pumps for Fire Protection, 1999.

12-1.2.8. NFPA 24, Private Fire Service Mains, 2002 edition.

12-1.2.9. NFPA 30, Flammable and Combustible Liquids Code, 2000 edition.

12-1.2.10. NFPA 70, National Electrical Code, 2002.

12-1.2.11. NFPA 72 (FAC), National Fire Alarm Code, 2002 edition.

12.1.2.12. NFPA 75, Electronic Computer/Data Processing Equipment, 2003.

12-1.2.13. NFPA 80, Fire Doors and Fire Windows, 1999.

12-1.2.14. NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems, 2002.

12-1.2.15. NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, 2001 edition.

12.1.2.16. NFPA 101 (LSC), Safety to Life from Fire in Buildings and Structures, 2003 edition.

12-1.2.17. ER 1110-345-700, Engineering and Design Analysis, Drawings and Specifications, 30 May 1997.

12-1.2.18. ADA Accessibility Guidelines for Buildings and Facilities (ADAAG).

12-1.2.19. MIL-HDBK-1022A (1022), Petroleum Fuel Facilities, 01 November 1999.

12-1.2.20. UL Fire Protection Equipment Directory (ULFPED), 2002 edition.

12-1.2.21. UL Building Materials Directory (ULBMD), 2002 edition.

12-1.2.22. UL Fire Resistance Directory (ULFRD), 2001 edition.

12-1.2.23. TI 800-01, Technical Instructions Design Criteria, 20 Jul 98.

12-1.2.24. Unified Facilities Guide Specification (UFGS).

12-1.2.24.1. Section 7840a, Firestopping, April 2003.

12-1.2.24.2. Section 13920A, Fire Pumps, December 2001.

12-1.2.24.3. Section 13930A, Wet Pipe Sprinkler System, Fire Protection, March 2003.

12-1.2.24.4. Section 13945A, Preaction and Deluge Systems, Fire Protection, March 2003.

12-1.2.24.5. Section 13851A, Fire Detection and Alarm System Addressable, February 2002.

**12-2 APPENDIX AND RECOMMENDATIONS.** Fire protection criteria in general that are stated in any reference, which are either in the appendix, stated as a recommendation or addressed with a “should” shall be considered to be mandatory requirements and will be incorporated into the design.

**12-3 DEFINITIONS**

12-3.1. **General.** Definitions as indicated in LSC shall be used unless otherwise noted.

12-3.2. **Fire Protection Work.** All construction materials and installation necessary to install complete fire alarm systems, automatic fire sprinkler systems, fire rated partitions, fire rated doors & hardware, fire rated windows & hardware, firestopping, fire rated construction, exit signs, automatic fan shutdown, all means of egress and any other work as designated by the DAHJ.

**12-4 AUTHORITY HAVING JURISDICTION (AHJ):** The AHJ is HQUSACE, CEMP-ET, Mr Robert Diangelo. The District Authority Having Jurisdiction (DAHJ) is the Honolulu Engineer District Fire Protection Engineer, CEPOH-EC-Q and will be consulted for all interpretations of fire protection criteria to be used in this project through the Contracting Officer or his representative. Contractor shall not contact the AHJ and shall direct all questions, interpretations and clarifications to the DAHJ. All requests for information by the Contractor shall be submitted to the DAHJ in writing through the Contracting Officer with the appropriate sketches, basis for waiver, specific question and any other information deemed necessary by the DAHJ. In general, a minimum of 7 calendar days is required by the DAHJ to respond to all inquiries. The 7 days will start from the day of receipt by the DAHJ. In the event interpretation or approval is required from AHJ, an additional 7 calendar days will normally be required.

**12-5 WAIVER TO CRITERIA.** All waivers to be processed in accordance with UFC shall be

forwarded to the DAHJ for preliminary assessment. Waivers are to be forwarded to AHJ for approval if deemed necessary by DAHJ.

**12-6 PRIORITY OF CONFLICTING REQUIREMENTS.** In general, Contractor to use UFC & UFGS as the main document for fire protection criteria and these documents shall take precedence over any other document in accordance with UFC. ETL's and specific code requirement will supercede general requirements found in UFC, otherwise the most restrictive requirement shall be provided. DAHJ shall be consulted on all conflicting requirements and reserves the right to make final determination or by coordinating with the AHJ if deemed necessary. Conflicting requirements of Life Safety and historical preservation shall be brought to the attention of the Contracting Officer in writing and resolved by the DAHJ and historical preservation officer.

**12-7 FIRE PROTECTION ENGINEER SERVICES.** Contractor shall hire a qualified Fire Protection Engineer licensed as a Professional Engineer to consult, design, inspect and prepare design drawings, specifications, calculations and supervise construction as necessary. Qualifications must be submitted in writing to the Contracting Officer for approval. Any other licensed professional engineer or architect, who is a current Member status of the Society of Fire Protection Engineers with qualifying experience can act as the Fire Protection Engineer. Approval through the Contracting Officer, in writing, by the DAHJ is required prior to commencement of the building design.

**12-8 IBC REQUIREMENTS**

12-8.1. **Allowable area and allowable height.** Design analysis shall confirm the allowable construction type and allowable area/height in accordance with IBC by calculating the allowable areas and submitting them in the design analysis. Any type of construction allowed by the IBC will be allowed on this project as long as IBC allowable area and height restrictions are provided.

12-8.2. **Location on property.** Design analysis shall show the exterior wall/opening protection required in accordance with IBC.

12-8.3. **Occupancy Separation walls.** IBC occupancy separation walls are required to be installed throughout the building in addition to the Protection from Hazards separation walls required in LSC.

**12-9 LIFE SAFETY REQUIREMENTS**

12-9.1. **General.** LSC with UFC amending portions of LSC are to be provided.

12-9.2. **Stairs.** All required stairs shall be protected in accordance with LSC.

12-9.3. **Magnetic Card Locks.** Use of magnetic card type locks shall meet LSC for egress.

12-9.4. **Firefighter Access.** Firefighter access shall be provided in accordance with UFC.

12-9.5. **Fire Rated Shafts.** Use of fire rated shafts shall be minimized on all buildings. All pipe risers shall be separated from the duct risers and be firestopped at the floors. All duct risers, which penetrate more than 1 floor shall be enclosed in a 1 hr fire rated shaft. Use of subducts are prohibited. Fire dampers shall be listed with ULBMD or FM and conform to Chapter 10 – HVAC.

12-9.6. **Interior Finishes.** Interior finishes shall be provided in accordance with LSC.

12-9.7. **Exit Signs.** Internally illuminated signs using Light emitting diode (LED) type shall be used.

12-9.8. **Portable fire extinguishers**. Provide portable fire extinguishers in semi-recessed cabinets throughout the building in accordance with NFPA 10 and shall be listed with ULFPE or FM.

12-9.9. **Fire rated assemblies.** Fire rated doors/door frames and windows (glazing and window frame) shall be listed by ULBMD or FM and shall be installed in accordance with the door/window manufacturer and NFPA 80.

12-9.10. **Fire rated construction.** All fire rated walls, floors, ceilings, floor/ceilings, roof/ceilings shall meet ULFRD or FM.

12-9.11. **Firestopping.** All penetrations of fire rated walls by ducts, pipe or conduit must be protected with listed firestopping and installed in accordance with the manufacturer's listed installation instructions. Listed installation instructions shall be submitted for approval to the Contracting Officer prior to installation. Firestopping shall be listed with ULFRD or FM.

12-9.11.1 Firestopping ID plate: A permanent wall identification plate (WID) and a pipe tag are required to be permanently mounted adjacent to every fire barrier penetration on both sides of the wall or floor. The WID plate shall be minimum 4" X 3"(102mm X 77 mm) in size and the pipe tag shall be minimum 1.5" X 1.5"(38mm X 38mm) in size, have raised letters & constructed of 20 gage minimum corrosion proof metal. In the event there are multiple pipe penetrations with the same firestopping system, a single wall ID plate can be used if each pipe penetration is listed on the WID plate separated with commas and each pipe is identified with a pipe tag. Information on the WID must be clearly readable from a minimum of 5 feet (1524 mm) Shop drawings to be submitted for approval. All WID and pipe tags to be submitted for approval prior to installation.

The wall ID plate shall contain the following:

___hr Fire Barrier Penetration
Pipe # _____
UL System #_____
Description: _____
_____
F rating: _____hr
T rating: _____hr
Wall/Floor Material: _____
Sealant ID _____
Manufacturer _____
Certified Installer:
Name: _____
Address: _____
_____
Installation Date: _____

Example:

1 hr Fire Barrier Penetration
Pipe # _1, 2, 5__
UL System #_WL2078_____
Description: _Plastic pipe thru 1 hr gypsum wall_____
F rating: _1_hr
T rating: _1_hr
Wall/Floor Material: Gypsum wall
Sealant ID: Hilti CP 642_____
Manufacturer _Hilti_____
Certified Installer:
Name: Mr Chester Yamamoto___

Company: Firestopping Inc.
Address: 1920 Ala Moana Blvd_
Honolulu, HI 96818__
Installation Date: 30 June 2003___

The pipe tag shall contain the following:

Pipe # _____
Insulated: _____
Pipe Material: _____
Pipe Size: _____
Use: _____

Example:

Pipe # 5__
Insulated: No
Pipe Material: CPVC
Pipe Size: _4"_____
Use: domestic CW

**12-10 FIRE SPRINKLER AND FIRE PUMP REQUIREMENTS**

12-10.1. **General.** All the buildings shall be provided with new wet pipe sprinkler system meeting FSC, FSCR, UFC and UFGS 13930. Sprinkler flow switches, pressure switches and tamper switches are to be connected to the building fire alarm panel.

12-10.2. **Design area and density.** Area/density method in accordance with the UFC shall be used. Hydrant flows shall be added to all hydraulic sprinkler calculations as indicated in UFC. Available water supply must provide the fire demand equivalent to the sum of sprinkler demand + hose stream(s) demand + domestic demand. Hydrant flow test shall be performed by Contractor to obtain available water supply capacity. Hydraulic calculations are to be performed using approved computer software. Minimum design hydrant pressure shall be 20 psig at full fire demand.

12-10.3. **Fire pump.** Listed engine driven fire pumps shall be provided in a building as indicated in accordance with UFC. Water storage tanks shall be provided in the event the available water supply flow capacity is exceeded and shall meet NFPA 22. Water tank capacity shall meet UFC. Fire Pump controller shall be NEMA type 4X. Fire Pump shall meet requirements in UFGS 13920A. Fire Pump Building shall be located 50 feet minimum from Quad C buildings (follow NFPA 20) and as indicated.

12-10.4. **Fire sprinklers.** Quick response sprinkler shall be used as a minimum in all Light Hazard occupancy areas throughout the building in accordance with FSC. Decrease in design area allowed by FSC for use with quick response sprinkler heads will be allowed.

12-10.5. **Fire Department Connections.** Fire department connections must be within 150 feet of hydrant.

12-10.6. **Backflow Preventers.** Double check type backflow preventers are required on all sprinkler system connections to the potable water supply, which are listed for fire service by an independent testing agency such as UL.

12-10.7. **Sprinkler flow farther than 10 feet from building.** All valves controlling sprinkler water flow farther than 10 feet from building shall be chain and locked open and all the valves 10 feet or closer to the

building shall be supervised with a weather resistant tamper switch connected to the fire alarm panel supervisory alarm circuit.

12-10.8. **Seismic requirements.** Seismic earthquake requirements in FSC are required.

12-10.9. **Plastic piping.** Plastic piping/fittings are not allowed.

12-10.10 **T drill fittings.** “T drill” method are not allowed.

12-10.10. **Post Indicator Valve.** Post indicator valve (PIV) is required on all sprinkler system supplies, NFPA 24. Elimination of the PIV will be allowed if the backflow preventer/shutoff valve assembly is located in the same location as the PIV, according to NFPA 24. Backflow preventer isolation valves to be indicating type with supervision.

12-10.11. **Hydrant flow test data.** Contractor shall use attached flow data and calculations for bidding purposes. The successful contractor shall perform a hydrant flow test to validate the project design after award. The hydrant flow test shall be performed in accordance with NFPA 291 and with the Schofield Barracks Water Treatment Plant clearwell pumps off. Flow data shall be submitted in accordance with Section Design After Award.

## 12-11 FIRE ALARM REQUIREMENTS

12-11.1 **General.** All buildings shall have fire alarm system including fire alarm panel, transmitter, and fire alarm annunciator, meeting FAC, ADAAG, LSC, UFC and UFGS 13851. All fire alarm systems shall be Class A, looped, addressable systems. Each building shall have a fire alarm panel and annunciator located inside the building on the 1st floor in an approved location. Special fire alarm requirements are found in UFC.

12-11.2. **T tapping.** T tapping of any fire alarm circuit is not allowed.

12-11.3. **Occupant notification.** All buildings shall be provided with visible and audible occupant notification appliances in accordance with ADAAG and FAC.

12-11.4. **Sequence of operation.** Fire alarm sequence of operations shown in the Fire Alarm Control Matrix (MATRIX) contained in Attachment 5.

12-11.5. **Server and Telecom Rooms.** Automatic smoke detection system shall be provided for the Server and Telecom rooms below raised floor and below ceiling, NFPA 75.

## 12-12 ROOF ACCESS

12-12.1 **Access Points.** Provide two roof access points for each of the buildings in this RFP (Bldgs 355, 356, 357 and 358), in accordance with the subsequent paragraphs.

12-12.2 **Access Locations.** For Building 355, the two roof access locations shall be on the third floor at the top landing of open exit stairs at grid lines "3" and "18". For Buildings 356, 357, and 358, the two roof access locations shall be on the third floor at the top landing of enclosed exit stairs at grid lines "2" and "20". Multiple roof access from a single exit stair shall not be permitted.

12-12.3 **Roof Access.** Roof access shall consist of hatch opening to the roof with an appropriate ladder. Clear hatch opening must be not less than 1.5 $m^2$ (16 $ft^2$) in area, with a minimum dimension of 610 mm (2 ft). Ladder shall conform to 29 CFR 1910.27, *Fixed Ladders*.

## 12-13 MISCELLANEOUS FIRE REQUIREMENTS

12-13.1. **Fuel tanks.** Fuel tanks installed for the fire pump shall be installed in accordance with UFGS

13920A, local and Federal requirements.

12-13.1.1 Provide single walled fuel tank as indicated on the attached drawings or aboveground concrete encased steel storage tank in an approved location. Aboveground concrete encased steel storage tanks are preferred by the Director of Public Works. Aboveground tank shall be located minimum 50 feet from above ground power lines. Distance from building and property lines shall be ½ of that indicated in 1022, 8.3.5.2.

12-13.1.2 Provide all appurtenances in 1022, Table 2 and NFPA 30, 2.3.2.3.3. General requirements of 1022, 8.5 shall be provided. Tank capacity shall not exceed 12,000 gallons. 40 CFR 112 requirements shall be provided, if the tank storage capacity exceeds 1320 gallons or a single container exceeds 660 gallons.

12-13.2. **Air handling units.** All air handling systems shall be provided with automatic shutdown in accordance with NFPA 90A. Air handling systems shall meet NFPA 90A and LSC.

12-13.4. **Server and Telecom Rooms.** Fire/smoke dampers are required in all ducts penetrating the Server and Telecom rooms. Other fire protection requirements of NFPA 75 shall be provided for the Server and Telecom rooms.

# CHAPTER 13

## SUSTAINABLE DESIGN

13-1. **SUSTAINABLE DESIGN GOALS**. This project shall be designed and constructed using sustainable design principles (within practical funding constraints) and an integrated team approach to provide a facility that:

- use resources efficiently and minimize raw material resource consumption, including energy, water, land and materials, both during the construction process and throughout the life of the facility.
- maximize resource reuse, while maintaining financial stewardship.
- move away from fossil fuels towards renewable energy sources.
- create a healthy and productive work environment for all who use the facility.
- display long-term value.
- protect and, where appropriate, restore the natural environment.

13-2. **PROJECT REQUIREMENTS**. The sustainable design integrated team approach will be summarized in the Sustainable Project Rating Tool document (SPiRiT). A SPiRiT Gold level is highly desired for this project. Sustainable design techniques shall be considered as they relate to site and building design, construction, and operation. Techniques that conserve energy, improve livability, and can be justified by life cycle cost analysis as cost effective are encouraged.

13-2.1. Engineer Technical Letter (ETL) 1110-3-491 provides basic criteria and information pertaining to the incorporation of sustainable design concepts in the design and construction of Military facilities. The level of incorporation of sustainable design principles will be measured through use of the Sustainable Project Rating Tool (SPiRiT). SPiRiT is the Army's version of the LEED Green Building Rating System™, developed by the U.S. Green Building Council (USGBC). The USGBC consists of the nation's foremost coalition of leaders from across the building industry working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. The ETL and SPiRiT are available from the following website: http://www.cecer.army.mil/sustdesign/.

13-2.2. Each offeror will complete and submit the SPiRiT document. The total point score will determine the SPiRiT Sustainable Project Level: Bronze, Silver, Gold, or Platinum. The SPiRiT document and additional sustainable design resources are found at Army's Sustainable Design and Development website: http://www.cecer.army.mil/sustdesign/.

13-2.2.1. The SPiRiT categories all follow the format:

- Intent: A statement of the primary goal for point credit.
- Requirement: Quantifiable conditions necessary to achieve stated intent.
- Technologies/Strategies: Suggested guidance on how to achieve the requirement.

13-2.3. The minimum requirement is a SPiRiT Silver level. Designs that do not achieve a SPiRiT Silver level shall be considered non-conforming. The proof-of-concept design is not intended to limit alternate designs that meet the Silver level of performance utilizing alternate methodologies.

13-2.4 Areas under consideration will include the following:

- Design strategies to minimize water runoff and promote percolation of water into the water table.
- Minimize or eliminate the need for irrigation of landscaped areas. This is a project requirement.
- Use of recycled or renewable construction materials.

- Use of low VOC materials. This is a project requirement for paint and carpet.
- Solar hot water heating.
- Use of water conservation plumbing fixtures. This is a project requirement.
- Natural ventilation in lieu of air-conditioning where possible. Use of ceiling fans and similar air movement devices.
- Use of high efficiency HVAC systems. This is a project requirement.
- Computerized Energy Management and Control System (EMCS)
- Maximizing use of daylight to augment conventional lighting.
- Energy efficient lighting fixtures. Energy-saving switching systems including multiple switching and occupancy sensors.
- Solar-powered site lighting.
- Photovoltaic energy production.

13-3. **SPiRiT REQUIREMENTS**. There are eight SPiRiT categories: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality (IEQ), Facility Delivery Process, Current Mission, and Future Missions. Four of the eight categories have requirements or prerequisites. These are minimum requirements that must be met. No further points within each category will be allowed unless the minimum is achieved. Proposals that do not meet these requirements or prerequisites listed in the SPiRiT document will be considered non-conforming.

13-3.1. SPiRiT minimum requirement 1.R1: Erosion, Sedimentation, and Water Control. Design a site sediment and erosion control plan and a pollution prevention plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:

- Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
- Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.
- Prevent hazardous material discharge into storm water systems.
- Prevent petroleum oils and lubricants (POL) discharge into storm water systems.

13-3.2. SPiRiT minimum requirement 3.R1: Fundamental Building Systems Commissioning. Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended. Implement all of the following fundamental best practice commissioning procedures.

- Engage a commissioning authority.
- Develop design intent and basis of design documentation.
- Include commissioning requirements in the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and documentation.
- Complete a commissioning report.

13-3.3. SPiRiT minimum requirement 3.R2: Minimum Energy Performance. Establish the minimum level of energy efficiency for the base building and systems. Design to meet building energy efficiency and performance as required by Technical Instruction (TI) 800-01 (This Design Criteria is available from the following website: http://www.hnd.usace.army.mil/techinfo/ti.htm). Weather data for Schofield Barracks area is shown in Attachment 15.

13-3.4. SPiRiT minimum requirement 3.R3: CFC Reduction in HVAC&R Equipment. Zero use of CFC-based refrigerants in new base building HVAC&R systems.

13-3.5. SPiRiT minimum requirement 4.R1: Storage & Collection of Recyclables. Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills. Provide an easily accessible area that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals.

13-3.6. SPiRiT minimum requirement 5.R1: Minimum Indoor Air Quality (IAQ) Performance. Establish minimum IAQ performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants. Meet the minimum requirements of voluntary consensus standard ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality and approved Addenda.

13-3.7. SPiRiT minimum requirement 5.R1: Environmental Tobacco Smoke (ETS) Control. Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS). Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, by providing a designated smoking room

designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building. The smoking room shall also be enclosed with impermeable structural deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least 7 Pa (0.03 inches of water gauge). Performance of smoking rooms shall be verified using tracer gas testing methods as described in ASHRAE Standard 129-1997. Acceptable exposure in non-smoking areas is defined as less than 1% of the tracer gas concentration in the smoking room as detected in the adjoining non-smoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

## CHAPTER 14

## COMPREHENSIVE INTERIOR DESIGN

14-1 **THE COMPREHENSIVE INTERIOR DESIGN (CID) PACKAGE**. This proposal requires the completion of a CID Package. The CID package is the design of the total interior environment. It requires a Building Interior Design (BID) and Furnishings Interior Design (FID). The two categories of interior design cover different aspects of the interior environment and are funded through different sources. The Design Build Offerers' must discuss the CID package with the customer and obtain their written approval of the CID.

14-1.1 **Building Interior Design**. BID is the design of related interior finishes such as walls, ceilings, floor coverings, and built-in casework. It involves the selection and sampling of all applied finishes for the building's interior features. With the exception of furniture systems, which are funded with operations and maintenance (O&M) or non-appropriated funding (NAF), Building Interior Design is funded with military construction funds (MILCON) appropriated by Congress. This proposal is funded by MILCON appropriations.

14-1.1.1 Building Interior Design will include interior floor plans, finish schedules, and interior color samples. If necessary, it should include interior elevations showing finish placement. The products and materials specified are procured and installed by the contractor.

14-1.2 **Furnishings Interior Design (FID).** FID is the design of interior furnishings and the finishes related to them. FID designs are typically funded by the installation with operations and maintenance (O&M) funds.

14-1.2.1 Furnishings Interior Design (FID) involves the selection and sampling of the furnishings components of the interior environment. This may include furniture systems, freestanding furniture, beds, desks, chairs, conference tables, and accessories including artwork. The FID will include furniture placement plans, information on all freestanding furnishings and accessories, furniture cost estimates, and order data sheets. These products and materials coordination with the Government to procure these items in order for them to be in place before the building is occupied. The products and materials specified are procured by the Government and installed by the contractor.

14-1.3 **Décor Theme**: the Design Build Offerers' are responsible to provide a Theme for the Dining Facility CID submission. The Design Build Offerers' shall discuss the theme with and obtain approval of the theme from the customer before submitting the final CID Package.

14-2 **PRESENTATION FORMATS.**

14-2.1 **Binders**. Building Interior Design and Furnishings Interior Design information and samples are to be submitted in 8-1/2" x 11" format in three-inch or four-inch D-ring binders. Fold out items should have a maximum spread of 25-12 inches. Each binder should be labeled on the outside spine and front cover with the following information:

- Building Interior Design or Furnishings Interior Design.
- Project Title and Number.
- Location.
- Date.
- Volume Number (example: Volume 1 of 3).

14-2.2 **Color Boards**. Color boards should be sturdy enough to support all samples. Large samples, such as ceiling tiles or carpet samples can be provided separately from the color board in a loose sleeve that can be moved from one scheme to another. Use page protectors that are strong enough to keep pages from tearing out. Anchor large or heavy samples with mechanical fasteners, velcro, double-faced foam tape, or contact cement. Do no use rubber cement or glue. Samples which can not be adequately fastened

should be labeled so they can be identified independently.

14-2.3 Material and finish samples should indicate true pattern, color and texture. Label all finish samples with material codes used in the project submittal. Photographs or colored photocopies of materials or fabrics are not preferred. Carpet samples should be large enough to show a complete pattern or design. If the specified carpet has a large pattern, provide a color photograph showing the overall pattern in addition to the carpet sample. Color photocopies of artwork and plants are acceptable.

## 14-3 DRAWING INFORMATION REQUIREMENTS

14-3.1 **Composite Floor Plan**. The floor plan should show all panels, components and free-standing furniture in relationship to the building and the building systems. This includes information on locations of light switches, fire pull boxes, mechanical devices, and other wall mounted items. The composite floor plan should be a full size contract drawing showing furnishing item numbers (where applicable), and gross and net areas of each floor.

14-3.2. **Workstation Panel Plan**. The panel plan should include a panel symbol legend, panel placements, critical dimensions, of aisles widths, and critical dimensions tying the panels to the building's structural, electrical and mechanical systems. Panels must not block access to mechanical, electrical or fire controls. Each panel should be coded with the following system:

| PANEL | WIDTH | HEIGHT |
|---|---|---|
| N (non-powered) or P (powered) | centimeters | centimeters |

For example, a non-powered panel 610 mm (2 feet wide) and 1727 mm (five feet eight inches high) would be noted on the plan as "**N 61 172.7**".

14-3.3 **Workstation Electrical, Voice, & Data Plans**. The electrical, voice and data plans should show any panel placements, all receptacles used in each workstation, height and location of all light switches and mechanical control devices, and a symbol legend. The workstation design must be coordinated with the building's communication and mechanical engineering drawings.

14-3.4 **Furniture Systems**. In the color guide specifications on furniture systems, indicate the fabric width, fiber content, and construction method for the workstations. The vendor should be indicated on the drawings and in the color guide specifications.

14-3.5 **Workstation Types and Number Codes**. The workstations should be classified into groups of like configuration and features. Each group or type should be given a single letter code (A, B, etc.). For example, all similar reception stations might be type A and all similar offices might be type B. Each workstation should also be given a unique number code similar to a room number but separate from the building room numbering system. Every workstation should be identified on every plan with the composite code composed of the letter identifying the type and the workstation number code. For example, "A110" would indicate that workstation number 110 is a type A station.

14-3.6 **Workstation Isometric/Elevation and Inventory Drawings**. These drawings should show an elevation or isomeric of each type of workstation with a related inventory list of all the panels and components used, and the method of attachment. The inventory list should describe components generically rather than using specific part numbers.

14-3.7 **Workstation Finishes**. It is suggested that three fabric finishes be used for furniture systems: one color for panels and one for tackboards and flipper doors. A third color will be used to unify workstations used by the same organizational group.

14-3.8 **Workstation Components**. An ergonomically designed chair should be included in the

workstation. The following items are some of the typical workstation components and options that must be selected and specified.

14-3.8.1 Panels.

| | |
|---|---|
| Acoustical/non-acounstical | Powered/non-powered |

14-3.8.2. Components.

| | |
|---|---|
| Work Surfaces | Drawers |
| Shelves (with/without doors) | Files (lateral, panel hung/bins) |
| Task Lights/Special purpose | Counter tops |
| Drafting surface | Freestanding Components |

14-3.8.3. Accessories.

| | |
|---|---|
| Tackboards | Locks |
| Shelf dividers | Reader stands |
| Paper flow devices | Market/chalk boards |
| Computer turntable | Printer stand |
| Coat rack | Wire guides |
| Keyboard trays | Mouse pads |
| Wrist rest/Foot rest | Disc storage |

14-3.8.4. Signs.

| | |
|---|---|
| Organizational signs | Workstation name signs |

14-3.9 **Health, Safety, Accessibility, and Environmental Quality**. Designers must consider safety, health, disabled access, and environmental standards. Many of these concerns are regulated by code authorities and quantified by standardized testing. Designers should be aware of pertinent regulations and should cite them in the submittals.

14-3.9.1 Health and Safety Criteria. Fire safety is one of the most important aspects in any design. Designers must comply with all appropriate fire safety codes and provide for safe egress in the event of fire. Code requirements on this issue are stringent, and there are several regulations relating to flammability of interior materials and furnishings. See Section 2, Criteria References.
Designers should provide protection against injury and death from falls, chemical emissions, electronic emissions, and microbial conditions. Indoor air quality should not be compromised.

14-3.9.2 Accessibility. All designs, including signage, must comply with the American Disabilities Act (ADA) or the Uniform Federal Accessibility Standards, whichever is the most stringent. The only exceptions to this requirement are facilities which limit their access to able bodied military personnel. These facilities are described in Sections 13 through 19.

14-3.9.3 Environmental Quality. Designers must provide an environment that is comfortable, welcoming, and conducive to work. Contributing factors include ergonomically correct furniture, appropriate efficient lighting, and good acoustical control.

14-3.9.3.1 Furnishings and equipment should be comfortable, sturdy, and designed for anthropomorphic fit and stability.

14-3.9.3.2 Lighting is an important tool in shaping the ambiance of the environment. Careful consideration should be given to lighting in order to produce a comfortable environment that is easy to live and work in. Reflectance should be minimized and task lighting should provide glare-free illumination of work surfaces.

14-3.9.3.3 Provide adequate acoustical control to ensure a good working environment.

14-4 **BUILDING INTERIOR DESIGN SUBMITTAL ITEMS.** Some items that are usually included in the Building Interior Design are listed below.

| | |
|---|---|
| Carpet | Resilient Floor Coverings |
| Ceramic Tiles and Stones | Terrazzo |
| Paint | Wallcoverings |
| Wood Stains | Wall Base |
| Ceiling Tiles and Grid | Plastic Laminates |
| Solid Surfacing Materials | Built-in Casework |
| Blinds and other Window Coverings | Marker Boards and Bulletin Boards |
| Toilet Partitions | Moveable Room Dividers |
| Cubicle Curtains | Signage |
| Trim and Hardware Finishes | Decorative Light Fixtures |

14-5 **FURNISHINGS INTERIOR DESIGN SUBMITTAL ITEMS.** Some items that are usually included in the comprehensive interior design are listed below.

| | |
|---|---|
| ADP Tables/Printer Stands/Support Furnishings. | Artwork. |
| Office Furniture | Desks, Chairs, Lamps, & Accessories. |

14-5.1 **Manufacturer's Summary List**. The Manufacturer's Summary List is a list of all the manufacturers whose products are used in the FID package. For each manufacturer, provide name, address, phone number, fax number, and a point of contact.

14-5.2 **Furniture Placement Plans**. This is a plan of one room showing each furniture component in the room. There will be one Furniture Placement Plan for each room in the Composite Floor Plan that contains furniture. Furniture Placement Plans are drawn at 1:50 (1/4" = 1'-0") if possible, or at 1:100 (1/8" = 1'-0") if the room or area is very large. Each Furniture Placement Plan should include the following information:

- The job name, location and date.
- The footprint of the room.
- The furnishings.
- The room name and number.
- A Furnishing Item Number for each furnishing item.
- Quantity of each product specified for the FID.

14-5.3 **Furniture Illustration Sheets**. Provide one Furniture Illustration Sheet for each item of furniture in the FID. The Furniture Illustration Sheet should include the following information:

- The job name, location and date.
- A picture or line drawing of the product specified.
- The Furnishing Item Number which keys the product to the Composite Floor Plan and Furniture Placement Plan.
- The options specified, if any.
- Specification data on the finishes and fabric.
- Samples of the finishes and fabric.
- A comprehensive list giving all occurrences of the item, sorted by room. For instance:

| | | |
|---|---|---|
| 4 each | Room 103 | Commander |
| 2 each | Room 104 | Receptionist |

Furniture Illustration Sheets should be arranged in numerical order by furnishing item number. The furnishing item numbers should begin with 001.

14-5.4 **Artwork Placement Plans**. Artwork Placement Plan shows the spatial relationship between the furniture and the artwork in a room. There will be one Artwork Placement Plan for each room in the Composite Floor Plan that contains artwork. Assign a furnishing item number to each piece of artwork. The Artwork Placement Plan will show the artwork but it will not show the furniture item number for clarity. Artwork Placement Plans are drawn at 1:50 (1/4" = 1'-0") if possible, or at 1:100 (1/8" = 1'-0") if the room or area is very large. Each Artwork Placement Plan should include the following information:

- The job name, location and date.
- The room name and number.
- A plan of the room locating the artwork.
- An elevation of each wall containing artwork showing mounting height.
- A Furnishing Item Number for each artwork item.
- Quantity of each product specified for the FID.

14-5.5 **Artwork Illustration Sheets**. Provide one Artwork Illustration Sheet for each piece of art in the FID. The Artwork Illustration Sheet should include the following information:

- The job name, number, location and date.
- The title of the artwork and the artist's name.
- A picture of the proposed artwork. Color photos are acceptable.
- The furnishing item number, which keys the product to the Composite Floor Plan and the Artwork Placement Plan.
- Name and number of the room where artwork will be displayed.
- Quantity of each product specified for the FID.
- Name and number of the room where artwork will be displayed.
- Frame description and sample of mat colors.
- Mounting height and installation instructions.
- Specify security mounting if required.

14-5.6 **Itemized Furniture Cost Estimate**. The itemized cost estimate lists all furnishings and indicates quantities, unit costs and totals. It is organized according to UNICOR and GSA/FSC Group, Part, and Section of the FSC Schedules. The cost estimate should also include a 10% general contingency and 7% installation listed as separate line items. Estimated freight charges that are not included in the furniture cost should be listed as a separate line item.

14-5.7 **Order Data Sheets**. The Order Data Sheets provide all information necessary to order the furnishings specified in the FID. Only one item should be listed per data sheet. The sheets should be in numerical order. The Order Data Sheet should include the following information:

- A Furnishing Item.
- The job name, location and date.
- FSC Group, Part, and Section.
- GSA contract No., Special Item No. (SIN), and contract expiration date.
- Maximum Order Limitation.
- Source and manufacturer's name, ordering address, telephone number and FAX number.
- Product name.
- Product model number or National Stock Number (NSN).
- Finish name and number.

- Fabric name and number.
- Dimensions.
- Weight.
- Description (construction information, fabric content, finish application, etc.).
- Justification. (Example: These guest chairs are coordinated to match the task seating at each workstation. The size of the guest chairs is critical because of the limited space where they are to be placed. If this company is not selected, coordinate the newly proposed finishes with furniture item numbers 001, 002, and 003.)
- Item location by room number.
- Quantity per room.
- Total quantity.
- Unit Price.
- Total Price.
- Estimated freight charges, 7% of item cost. (note whether or not freight charges are included in the price of the FID item.)
- Special instructions (if any).

14-5.8 **FID Cost General Information**.

14-5.8.1 Furnishing Sources. Furniture may be obtained from three source categories: UNICOR, GSA FSC/FSG, and open market. UNICOR is the trade name for the Federal Prisons Industries Inc. (FPI), a wholly owned government corporation established in 1934. General Services Administration Federal Supply Class/Federal Supply Groups list products on GSA contract. Government contracts with private manufacturers that have a fixed price, a maximum order limitation, and fixed expiration date. Every effort should be made to use UNICOR or GSA. There may be on occasions when there is no current FSS/GSA or UNICOR resource for a furnishing requirement, or when items available on FSS/GSA contract or from UNICOR do not meet the functional requirements of the project. If the latter occurs, the Contracting Officer must submit a Request of Waiver to UNICOR. The FID designer shall assist in the waiver process by providing required information. GSA sources are not mandatory for DoD projects, but all procurement procedures must be followed as stated in the FAR, Federal Acquisition Regulations. Open market line items over $2,500 will require a justification letter. Open market line items over $25,000 will have to be solicited by bid, and solicitation documents including detailed specifications will be required. Line items under a General Service Administration (GSA) contract that exceed the maximum order limitation will also require a formal solicitation for bid.

# CHAPTER 15

## HISTORIC PRESERVATION

15-1 **DESIGN BACKGROUND.** Quad C is recognized as a historically significant group of structures, and is a contributing element in the Schofield Barracks Historic District, which is listed on the National Register of Historic Places. Every effort has been made in this design to retain the historic fabric of the buildings that constitute Quad C. Specific character-defining features and their treatment in the proposed design are discussed below.

15-2 **GUIDELINES.** Rehabilitation of Quad C and all new construction shall be consistent with The Secretary of the Interiors Standards for Rehabilitation & Illustrated Guidelines for Rehabilitating Historic Buildings, (1997). Both the exterior and the interior work will retain, repair, or replace, in-kind, all character defining features.

15-3 **DEMOLITION.** No additional or unapproved demolition work shall be proposed to any of the four buildings at Quad C. Wherever possible, additions previously constructed that are not original to the four buildings, shall be removed.

15-4 **ADDITIONS.** No new additions shall be constructed to any of the four buildings at Quad C.

15-5 **WINDOWS.** The rhythm of original window openings and window size and shape of the exterior windows shall be retained. The windows will match their original height, eliminating the blank panels and vents that exist in the existing building. New windows shall be installed in the openings to match the original windows in appearance. Real or false muntins will be installed that match the patterns in the original windows. If false muntins are used, muntins shall be installed on both sides of each window.

15-5.1 If metal window frames are utilized, window frames, finish, and color shall match those used at Quad F. Glass provided at Quad F are “All Season Commercial 5/16 tint lam (1/8 Solex, Ann, 060clr, 1/8 clear ann) with 0.62 shading coefficient, 72% visible light transmittance”. Paint finish is “Fluoro Guard Powder Coating, color #14284, Sierra Tan”. Contractor to verify all finishes and colors. All exposed surfaces of the metal should be painted. Window frame style, finish and color shall be approved by the CRM.

15-5.2 Structural glazing system should be utilized to allow the required thickness of the window sash frame to be reduced. Sash frame and muntin and mullion thickness that match the original dimensions as closely as possible should be used.

15-5.3 Window glazing shall be visibly clear, and tinting shall not be dark or reflective. Glazing shall be the same as used at Quad F, and shall be approved by the CRM.

15-5.4 Louvers used in original window openings shall be painted the same color as the window frames.

15-5.5 All hardware selected shall be of an appropriate historic style to be compatible with the original historic style windows. All hardware selections shall be approved by the CRM.

15-5.6 All existing window openings adjacent to the exterior walkways shall be almost entirely retained. The only window openings that will not be retained are where fire safety code requirements do not allow an opening adjacent to a fire exit. Here the opening shall be in-filled with a reveal so that the shape of the original opening is still apparent.

15-6 **DOORS.** All original door openings, especially those adjacent to the exterior walkways, shall be almost entirely retained. Where original door openings have been filled in, or partially in-filled to provide a

window, the opening shall be returned to a door. Doors shall match the appearance of the original doors. Where operable doors are not desired, fixed doors or a false door shall be used that has the same appearance as the original doors.

15-6.1 All hardware selected shall be of an appropriate historic style to be compatible with the original historic style doors. All hardware selections shall be approved by the CRM.

15-7 **EXTERIOR WALKWAYS.** All exterior balcony walkways on the quadrangle side of the buildings shall be kept open, and shall not be enclosed. If enclosure is absolutely unavoidable, the arched openings shall not be affected. Wherever possible, walkway areas that have previously been enclosed shall be returned to the original open layout.

15-7.1 The open breezeway at the first floor of Building 355 shall be kept open.

15-7.2 Exterior rails: Galvanized steel pipe rails will be installed to match the original rail design (see original drawings or the railings at Quad B for original rail size and style). Compliance with current code requirements for a maximum of 4" spherical clearance between rails will be accomplished with the addition of 3-inch steel pipe railing and post (typical) with 1/8-inch diameter cable pickets, and 1-1/2-inch steel pipe railing and post (typical) with 1/8-inch diameter cable pickets at the open stairwell. This will restore the basic appearance of the rails while improving safety in as unobtrusive a manner as possible. The existing concrete railings shall be retained.

15-8 **ROOF.** Where the roof structure is to be replaced, the original decorative eave soffit details shall be reconstructed and installed. Original construction drawings and historic photographs shall be consulted for the design.

15-9 **MECHANICAL AND ELECTRICAL EQUIPMENT.** To the maximum extent possible, mechanical equipment will be housed out of sight. Large utility equipment will be kept out of the quadrangle courtyard area as much as possible, and will be located to negatively impact the historic structures to the minimum extent possible.

15-9.1 Existing interior space will be utilized to house new mechanical, electrical, and communication equipment. All existing mechanical and/or electrical conduits or chases shall be removed, reduced or entirely relocated, wherever possible, to reduce visual impact to the historic character of Quad C. No chiller lines or condensate drain lines will be visible on the exterior of the building. This will be an improvement from the existing condition.

15-10 **ELEVATOR.** The new elevator shall be designed and installed to minimize visual impact to the historical character of Building 355 and to Quad C, as a whole.

15-11 **GYMNASIUM.** The gymnasium was originally used as a theater, and is one of the few areas in the four buildings that still remains in a layout similar to the original. This room shall remain as a large open space, and shall not have any enclosures or divisions constructed on the interior. The original operator's room and stair leading to it shall be retained, as well as the historic small wood windows inside the operator's room. The arched impressions, decorative moldings, and windows to the operator's room located at the gymnasium walls shall be retained. Structural analysis has indicated that the existing concrete walls require strengthening to meet current codes and standards. The RFP or DB designers shall attempt to find a solution for the strengthening of the walls in the gymnasium that will not obscure the decorative moldings at the walls. This may require ending the wall thickening below the molding, or strengthening the wall from the outside. Recommend reference to Quad F's solution for this challenge.

15-12 **PAINTING.** Exterior walls shall be entirely painted the light color of the standard paint color scheme except for the bottoms of the walls, which may be painted the darker color. The decorative frieze at the top of the building walls and the horizontal band between floor levels shall not be painted a contrasting

color, and shall be painted the same light color as the walls. Doors and door frames may be either the dark color of the base, or the medium tone color of the window frames or base trim color.

15-12.1 Painting schedule and all paint colors shall be approved by CRM.

# CHAPTER 16

## ENVIRONMENTAL REQUIREMENTS

16-1 **ENVIRONMENTAL ISSUES:** Overall environmental goal for the Whole Barracks Renewal Brigade Complex QUAD C is to provide a safe and healthy environment for residents, facility users and the installation.

16-2 In general, there are six potential environmental concerns:

1) Proper removal of asbestos building materials and deteriorated lead paint;
2) Proper disposal of barracks and administrative space demolition debris which contain asbestos and lead paint;
3) Proper handling and disposal of the PCB containing light ballast from the fluorescent light fixtures;
4) Proper disposal of excavated soil resulting from removal and disposal of possible leaking underground heating oil storage tanks associated with former boiler room activities;
5) Proper handling and disposal of mercury lamp switches.
6) Worker safety protection due to exposure during construction.

16-3 **ASBESTOS:** An asbestos survey for QUAD C has been completed. A copy of the report prepared by Soil and Land Use Technologies, Inc. is provided in the Appendix.

16-3.1 **Notification**. Under 40 CFR Part 61, Subpart M, owners of buildings and/or their Contractors are required to notify applicable State and Local agencies and/or EPA Regional Office prior to any demolitions, or renovations of “facilities” where asbestos material will be disturbed. In addition, the Asbestos National Emissions Standards for Hazardous Air Pollutants (NESHAPS) requires special removal, handling, and disposal practices to be followed during demolitions and renovations of all facilities. Contractor shall complete EPA notification form, postmarked at least 10 working days prior to the start of any demolition (including where no asbestos is present) or renovation activity that will disturb asbestos.

16-3.2 **Removal:** The selected offeror shall remove all asbestos containing material identified on project drawings for the renovation. The removal shall be in accordance with 29 CFR 1926.1101, Asbestos in Construction and Hawaii Administrative rules (HAR) Chapters 11-501 - 11-504. If additional asbestos is identified, that was not identified in the report, it shall be brought to the attention of the Government before proceeding with any action. After abatement, encapsulation shall be applied to these surfaces. Please see Asbestos Specification 13280 - Asbestos Abatement in the appendix.

16-3.3 **Disposal**. Asbestos containing building material shall be disposed of an approved Federal/State or local landfill. Please see applicable State of Hawaii Laws under Section 16.9. Please review the document, State of Hawaii Department of Health Solid and Hazardous Waste Branch Office of Solid Waste Management Disposal of Asbestos-Containing Waste Materials (Eff. January 1, 2003).” All applicable laws under this guidance must be followed.

16-4 **LEAD**: Due to the age of the facility (Quad C), it is assumed that lead is present on all painted surfaces.

16-4.1 **Removal.** The selected offeror shall remove lead in accordance with 29 CFR1926.62 and be a listed EPA certified lead firm on the EPA Region 9 website. Contractor shall remove all loose and flaking paint observed above the false ceiling and on walls, pillars that will not be demolished. Please see Specification 13281 Lead in Construction in the Appendix.

16-4.2 **Disposal**. Please review the document “State of Hawaii Department of Health Solid and Hazardous Waste Branch Office of Solid Waste Management Disposal of Lead-Based Paint Waste (eff.

January 1, 2003." Please see applicable Federal and State Laws under Section 16.9. The waste generated for Quad C is exempt from hazardous waste laws.

16-5 **PCB LIGHT BALLASTS.** The PCB Containing Ballasts in the fluorescent light fixtures must be removed prior to the disposal of the light fixture. A hazardous material survey has been conducted for Quad C. Please see Appendix for Hazardous Material Survey Report.

16-5.1 **IDENTIFICATION OF PCB LIGHT BALLASTS (CAPACITORS):**

The following guidelines should be used in identifying capacitors that contain PCB's:

- All capacitors manufactured through 1979 contain PCB's
- Capacitors manufactured after 1979 that do not contain PCBs are labeled "NO PCBs".
- If a capacitor is not labeled "NO PCBs", it is assumed to contain PCBs.

16-5.2 **Disposal Options.** Disposal of the PCB containing light ballasts is to be accomplished in accordance with 40 CFR 761, Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and use Prohibitions.

16-5.2.1 Subtitle D Landfills: Many small capacitors are disposed of in this manner due to low cost; however, the PCB's are not eliminated from the environment.

16-5.2.2 PCB Removal/Recycling. This option involves the removal of the four-ounce capacitor and the potting material from the ballast. This remaining materials are recycled for scrap metal. The only PCB recycling company on island is Saleesco USA, Honolulu HI and can be reached at 1-800-368-9095.

16-6 **UNDERGROUND STORAGE TANKS:** Disposal of contaminated soil resulting from the removal of underground heating oil tanks shall be sampled to determine if it is to be considered hazardous/non-hazardous or State of Hawaii Department of Health (HDOH) chemicals of concern in accordance with the Technical Guidance Manual for Underground Storage Tank Closure and Release Response. Chemicals of concern are associated with past site activities. If the soil is hazardous, it must be remediated locally or shipped to the mainland for disposal at a RCRA permitted landfill or incinerated. If the soil is non-hazardous it can be handled locally provided HDOH criteria are observed.

16-6.1 When petroleum impacted soil (discoloration and strong petroleum odor) is uncovered by the Contractor while excavating soil for the project, the Contractor shall immediately notify the Directorate of Public Works (DPW) and excavation shall stop. A representative from the Corps of Engineers, Environmental Technical Branch shall also be notified of the discovery. The Corps of Engineers technical advisor will visit the site and indicate the quantity of samples to be taken.

16-6.2 The Contractor will be requested to conduct a Site Investigation (SI) at the project site by collecting subsurface soil samples (using hydraulic direct push technique or drilling of borings) to fully delineate the vertical and horizontal extent of the contamination. Soil samples shall be analyzed in accordance with *Table 7.2 - Recommended Chemical Analysis for UST Closure and Release Response dated 9/18/92 of the Hawaii Department of Health (HDOH) Technical Guidance Manual for Underground Storage Tank Closure and Release Response (UST-TGM).* Based on the laboratory analytical, and the site's characteristics, the Contractor shall evaluate the migration pathways of the contaminant through the soil and the potential receptors of such contamination. Any required remediation of contamination shall be done under a separate action.

16-6.3 **Sampling Analysis Plan (SAP)**

16-6.3.1 The Contractor shall prepare a site specific sampling and analysis plan. The plan shall identify responsibilities and qualifications of all personnel, the Contractor's methods, equipment, procedures and

tentative schedule for conducting field work. The SAP shall contain maps showing the tentative sampling locations and rational for selecting those locations. The plan shall be reviewed by the Government before the start of field work. The plan shall include a detailed discussion of the technical approach to be used to implement the requirements for field activities, laboratory activities, and report of analytical data.

16-6.3.2 The SAP shall address chemical quality management including data quality objectives (DQOs) for on-site testing as well as laboratory testing. The SAP shall propose the process for assigning sample identification, field documentation, QA/QC samples, test methods, sample packing, chain of custody, and shipping etc. The SAP shall include provision for collecting and analyzing ten percent field QA/QC samples. The Government will designate an USACE validated laboratory for QA sample analysis.

16-6.3.3 **Test Items and Suggested Analytical Methods**

| *Analyses and Sites* | *Method* |
|---|---|
| *-Polynuclear Aromatic Hydrocarbons (PAHs)* | *8100*<br>*8310*<br>*8270C* |
| *Aromatic and Halogenated Volatile Organic Compounds (including Methyl Ethyl Ketone)* | *8021B*<br>*8260B* |
| *Lead/Cadmium* | *6000/*<br>*7000* |
| *PolyChlorinated Biphenyls (PCBs)* | *8082* |
| *TPH- Diesel/Oil Range Organics (excavated area)* | *8015B* |
| *TPH-Gasoline Range Organics* | *8015B* |
| *TCLP (stockpile)* | *TCLP* |
| *TPH- Diesel/Oil Range Organics (stockpiles)* | *8015B* |

16-6.3.4 **Site Investigation (SI) Report.** The Contractor shall prepare a SI report to be submitted after evaluation of laboratory data.

The report shall, at a minimum, include the following elements:

- Summary of work performed including but not limited to the narrative of the field work, mobilization and demobilization, site set up, analytical data and location maps were samples were taken, etc.
- Relevant Conversation Records that had impacted the SOW, project costs.
- Evaluation of potential migration pathways and receptors.
- Source of contamination and recommended course of action.

The report shall be reviewed by the USACE's Environmental Technical Branch. Should the levels exceed the regulatory clean up levels, determination of the disposal method will be discussed with the Government Environmental Technical representative and the State of Hawaii Department of Health, Hazard Evaluation & Emergency Response (HEER) Office.

16-7 **MERCURY SWITCHES.** The mercury containing switches, usually found in thermostats and silent light switches must be removed and disposed of properly prior to building demolition. Each switch may contain approximately 3,500 milligrams of mercury in a small electrical switch. The mercury may be

disposed of at a hazardous waste landfill or recycled. A hazardous material survey has been conducted for Quad C. The report is located in the Appendix.

16-8 **SAFETY.** Occupational Safety and Health Administration (OSHA) 29 CFR 1926, Safety and Health Regulations for Construction, will be followed at all times during construction for worker safety protection. Debris and soil containing fuels and hazardous construction materials are assumed to be a concern to worker health and the appropriate personnel protection equipment shall be used.

16-9 **APPLICABLE FEDERAL AND STATE LAWS AND ACTIONS.** Except as specified otherwise in the RFP, design and construction facilities shall comply with the latest editions (as of the date on the RFP) of the following. Major environmental federal/State and local guidance and regulations are listed below:

16-9.1 **Asbestos**

16-9.1.1 29 CFR 1926.1101 Asbestos in Contstruction

16-9.1.2 Hawaii Revised Statute (HRS) Chapter 342P.

16-9.1.3 Hawaii Administrative Rules (HAR), Title 11, Chapters 501 - 504.

16-9.1.4 Hawaii Administrative Rules, Title 12 Chapter 145.1, HIOSH Construction Standard, Asbestos.

16-9.1.5 Hawaii Administrative Rules, Title 16, Chapter 77, Subchapter 19, Asbestos Contractors, Department of Commerce and Consumer Affairs (DCCA)

16-9.1.6 Resource Conservation Recovery Act , Subtitle D

**16-9.2 Lead**

16.9.2.1 According to Section 403 of the Toxic Substance Control Act (TSCA), as amended, the Environmental Protection Agency (EPA) defines lead-based paint (LBP) as paint with lead levels equal to or exceeding 1.0 milligrams per square centimeter (mg/cm2) or 0.5% by weight.

16-9.2.2 The Department of Housing and Urban Development (HUD) had similarly defined lead-based paint as any paint, varnish, shellec or other coating that contains lead equal of greater than 1.0 mg/cm2 as measure by x-ray fluorescent (XRF) or laboratory analysis, or 0.5% by weight (5,000 ug/g, 5,000 ppm or 5,000 mg/kg) as measured by laboratory analysis.

16-9.2.3 In 1978, the consumer product Safety Commission (CPSC) banned the sale of residential paint containing greater than 0.06% lead (a trace amount). The CPSC also prohibited the used of such paint in residences and other areas where consumers have direct contact with painted surfaces.

16-9.2.4 The EPA policy entitled, “Update on Lead-base Paint”, dated August 2000 states that residential LBP waste is not subject to Resource Conservation & Recovery Act (RCRA) Subtitle C (federal hazardous waste) regulations. “Contractors can manage residential lead based paint waste as household waste.” Residential sources of LBP waste include, but are not limited to single-family homes, apartment buildings, row houses, **military barracks** and college dormitories.

16-9.2.5 EPA defined “residential lead-based paint waste” in a Federal Register “Proposed Rule”, October 23, 2001 (Vol. 66, No. 205). Residential lead-based paint waste is waste generated as a result of lea-based paint activities (including abatement, renovation, rehabilitation, and remodeling) in homes and other residences. The term includes, but is not limited to lead-based paint debris, chips, dust, and sludges.

The term does not include LBP waste from demolition activities.

16-9.2.6 The EPA interprets residential LBP waste to be household waste under 40 CFR 261.4(b)(1).

16-9.2.7 Hazardous waste regulations, known on the federal level as RCRA Subtitle C are enforced within the State of Hawaii Under Hawaii Revised Statutes (HRS) 342J and Hawaii Administrative rules (HAR) Title 11, Chapters 261 through 280. Chapter 11-261, HAR defines “household waste” as “any material derived from households (including single and multiple residences, hotels and motel, bunk houses, ranger stations, crew quarters, campgrounds, picnic grounds and day use recreation areas)

16-9.2.8 Solid waste regulations, are enforced within the State of Hawaii under HRS 342H and HAR Title 11, Chapters 58.1 (11-58.1), and provide broader authority to the Department of Health (DOH) than Federal regulations, known as RCRA subtitle D.

16-9.2.9 Hawaii Administrative Rules, Title 12 Chapter 148.1, HIOSH Construction Standard, Lead.

16.10 **MERCURY 7 UST**

Solid and Hazardous Disposal Act as amended by the Resource Conservation and Recovery Act, and amendments (RCRA), Public Law 94-580, Solid Waste Disposal Act. Among other items, this Act requires Federal Agencies must obtain permits for their hazardous waste treatment, storage and disposal facilities. Proper shipping papers (manifests), packaging, and labeling must be used when transporting hazardous waste. The 1984 amendments apply the requirements to persons who generate as little as 100 kilograms of hazardous waste in any month and require registration and controls on underground tanks used for storing oil and hazardous waste.

16-11 **Polychlorinated Biphenyls (PCB)**

16-11.1 Hawaii Administrative Rule (HAR) 11-273 and 40 CFR Part 273, Hazardous Waste Management Standards for Universal Waste Management.

16-11.2 Toxic Substances Control Act, Public Law 94-469, as amended. This Act requires Federal Agencies to properly manage the use and disposal of all toxic substances and management of Polychlorinated Piphenols (PCB) and items that contain PCB.

16. 12 **SAFETY AND HEALTH**

Hawaii Revised Statute, Chapter 396, Occupational Safety and Health Law.

# CHAPTER 17

# LANDSCAPE DESIGN

17.1 **OBJECTIVES**: The landscape of Quad C shall provide an aesthetically pleasing setting and a quality environment that creates a sense of place and pride for the Soldiers who will work and live in the barracks complex. The streetscape plantings of Foote Avenue and the Quad C parking lots shall integrate the various functional areas to unify the historic district of Schofield Barracks. The landscape plan shall enhance the installation's image by implementing the recommendations of the Exterior Architectural Plan and the Cultural Resources Management Plan. The plan shall conform to antiterrorist/force protection guidelines and apply the principles of sustainable design and traffic calming. The design shall promote simplicity, apply best management practices, and select appropriate materials to achieve visual quality at low to moderate maintenance costs.

17.2 **References**. The following references are available for review at the Engineering Section (Agronomy) , Directorate of Public Works, located at Building 104 3rd Floor, Wheeler Army Airfield, Oahu, Hawaii.

17.2.1 Schofield Barracks: Installation Exterior Architectural Plan (IEAP), U.S. Army Corps of Engineers, October 1`986.

17.2.2 Schofield Barracks: Cultural Resource Management Plan, U.S. Army Corps of Engineers, April 2000.

17.2.3 Streets and Sidewalks, People and Cars, The Citizen's Guide to Traffic Calming, Dan Burden, April 2000.

17.2.4 Sustainable Training Regimen for Planners, Architects, and Engineers, Department of Defense, 2000.

17.2.5 How to Save Trees During Construction, Tree City USA Bulletin No. 7, National Arbor Day Foundation.

17.2.6 Trees and Development: A Technical Guide to Preservation of Trees During Land Development, Nelda Matheny and James Clark, 1998.

17.2.7 City and County Ordinance No. 00-54, Exceptional Trees, City and County of Honolulu.

17.3 **Design Considerations**

17.3.1 Antiterrorism/Force Protection (AT/FP). The AT/FP guidance discourages landscape plantings that exceed 6 inches in height within 33 feet of a barracks building. This requirement shall result in the removal of the existing shrubs, hedgerows, groundcover, and the majority of trees growing close to the structures of the quad. New landscape plantings are allowable within the 33 feet standoff distance as long as the trees have single trunks and have upright (columnar or round-shaped) canopies. Canopies of mature trees shall not have low hanging branches and shall clear the building by 15 feet.

17.3.2 Historic Preservation Landscape Program. The large, mature trees such as monkey pods, ear pods, banyans, silk oaks, and tall Norfolk Island pines and royal palms are characteristic of the landscape of the quads and the preservation of these heritage trees is important in maintaining the ambience of the historic district. In addition, tree gaps created by earlier tree removals shall be filled in with new plantings of the same tree species to re-establish the rhythmic pattern of the streetscape. Another important feature of

the historic district is the open spaces such as the green belt along Meigs Avenue and the central court of the quad that were key elements of the original installation layout.

17.3.3 There are no Exceptional Trees protected by City and County of Honolulu ordinance in the project site.

17.3.4 Foote Avenue Corridor (Glennan Avenue to Meigs Avenue). The establishment of street trees along the length of Foote Avenue shall define this major thoroughfare and create a strong visual edge of the historic district. The Foote streetscape shall mirror the existing shade tree plantings of Waianae Avenue that borders the quads on the north. The tree plantings shall also reduce the scale of the quad building facade, calm traffic, and provide shade to the area. Hedge plantings shall screen the parking lots to visually unify the area and reinforce the integrity of the historic district. Wide walkways on both sides of this main corridor shall promote pedestrian and bicycle traffic.

17.3.5 Screens and Buffers. The use of trees, hedgerows and other landscape screening methods shall conceal unsightly areas or structures to enhance visual image.

17.3.6 Plant Selection. The landscape plants shall reinforce a tropical theme with emphasis on the use of palm trees. When possible, material selection shall reflect the orange and yellow colors of the 25$^{th}$ Infantry Division's insignia. Plant species shall be easy to maintain, locally hardy, and tolerant to the specific site conditions. The use of suitable native species is encouraged. Poisonous plants and trees that bear edible fruit, are very littersome, or have aggressive root systems shall not be utilized.

17.3.7 Sustainable Sites Design. The project shall minimize site disturbance to prevent soil erosion and to protect the existing trees and their roots. The design shall minimize off-site storm water runoff by promoting the use of pervious surfaces. The landscape design shall integrate water conservation measures by installing hardy native plants, drip irrigation systems, and mulches. The design shall apply alternative treatments to minimize lawn areas and landscape for energy conservation by planting appropriate shade trees in locations to cool adjacent streets, parking lots, walkways, and buildings.

17.3.8 Minimize Tree Conflicts. The design shall select tree species with non-aggressive root systems to minimize tree root conflicts with foundations, sidewalks, and underground utilities. Tree selection shall also fit (size and shape) the species to match the available growing space above and below ground. The design shall locate new tree plantings to avoid potential conflicts. In new planting locations and existing tree sites where root conflicts are inevitable, install treatments that will mitigate the situation.

## 17.4 LANDSCAPE MINIMUM REQUIREMENTS

17.4.1 Tree Preservation and Removal

17.4.1.1 The preliminary inventory of existing trees for the project area is shown in the attached RFP reference drawing entitled LANDSCAPE MASTER PLAN. (Note that additional existing tree inventory information will be shown on the topographic survey and will be provided to the Offeror during the advertising period.) This plan classifies each individual tree into one of three classes as indicated below:

17.4.1.2 Refer to RFP Concept Design Drawings for tree preservation and removal requirements.

17.4.1.3 Reserved.

17.4.1.4 Reserved.

17.4.1.5 Reserved.

17.4.1.6 Tree Protection Zone. No grading, compaction, or construction activity shall occur in this zone immediately surrounding a Class A tree. All underground utilities, storm drains and irrigation lines should be routed outside the tree protection zone. If utilities must traverse the tree protection zone, they shall be tunneled or bored at a depth of 4 feet or greater within the zone. For broad spreading canopy trees, the zone shall extend radially outward to 20 feet from the external surface of the trunk. For all other broadleaf type of tree species, the zone shall extend to 15 feet. For all palm trees, the zone shall extend to 10 feet. The zone shall be entirely enclosed by a temporary fence prior to any demolition work and shall remain in place until all site work and building construction are completed. The location of all Class A trees shall be identified in the offeror's Demolition Plan, Landscape Plan, Grading, and Utility Plans.

17.4.1.7 Tree Protection During Demolition and Construction

17.4.1.7.1 The Contractor shall retain the services of an arborist who has been certified for at least 5 years with experience in tree protection during construction, tree pruning and transplanting trees. The Contracting Officer shall approve the selection of the certified arborist. The arborist shall provide consulting services and perform quality assurance duties during the contract period. The arborist shall serve as the Contracto's liaison with The Outdoor Circle on matters pertaining to the protection of the trees on the project site. The arborist shall also ensure that branch and root pruning and tree relocation work are performed in accordance with standards of the National Arborist Association and the International Society of Arboriculture; proper measures are taken to protect the canopies and root systems of the trees from unnecessary damage from construction activity; when potentially damaging construction activity is performed, that such activity is performed in a manner that will minimize damage to the tree; and trees are provided with irrigation and proper care and remain in good health during the demolition and construction period.

17.4.1.7.1.2 The Contractor shall arrange a pre-construction meeting attended by the Contractor, subcontractors, Contracting Officer, DPW Agronomist, and the Contractor's certified arborist to review procedures for performing tree-related work, work in the areas of saved trees, access routes, storage areas, and measures to protect trees during construction.

17.4.1.7.1.3 Protection Fence. The Contractor shall erect a temporary fence around each saved tree such that the fence encloses the tree protection zone as a minimum (Diagram 1). The fences shall be erected prior to the commencement of any work and shall not be removed until all work that is potentially injurious to the trees is completed. If an existing structure prevents proper enclosure of the tree protection zone prior to demolition, the Contractor shall initially erect the fence around the tree to the extent that is reasonably possible. After demolition, the fence shall be reconfigured to enclose the tree protection zone. Protection fences shall not be relocated or removed without the written permission of the arborist.

17.4.7.1.4 Limitation of Construction Activities under Existing Tree Canopies. The Contractor shall limit activities under the canopy of existing trees to only those activities explicitly required to complete the construction under and/or adjacent to the tree's canopy as shown and specified. All excavation work required under the canopy of the tree shall be performed under the direction of the arborist. Material and topsoil stock piling, vehicle parking, temporary roadways, construction material mixing, portable latrine, and field office will not be allowed under the canopy. Spoils, waste, and washout water shall not be deposited or stored, either temporarily or permanently, under the canopy.

17.4.1.7.1.5 Tree Pruning. A certified tree worker under the general supervision of a certified arborist shall perform the tree pruning and root pruning work.

17.4.1.7.1.6 If injury should occur to any tree during construction, the Contractor shall immediately report the injury to the certified arborist. The certified arborist shall evaluate the injury and apply appropriate treatments. The Contractor shall submit a written report of the tree injury and treatment to the Contracting Officer.

17.4.1.7.1.7 Tree Maintenance. The Contractor shall irrigate the trees as necessary to maintain their health during the course of the demolition and construction period. Groundcover growth within the fenced-in area shall be maintained at a height not to exceed 250 mm (10 in). The application of herbicides is prohibited under the canopy of the trees.

17.4.1.7.1.8 Root Pruning. Before grading, pad preparation, or excavation for foundations, footings, walls, or trenching, prune roots that are greater than two (2) inches in diameter by manually digging a trench and cutting exposed roots with a saw, vibrating knife, rock saw, narrow trencher with sharp blade, or other approved root pruning equipment. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw.

17.4.1.7.1.9 If temporary haul or access roads must pass over the root area of trees, a roadbed of 6 inches of mulch or gravel shall be created to protect the soil. The roadbed material shall be replenished as necessary to maintain a 6-inch depth.

17.4.2 New Tree Plantings for Restoration. Provide Silk Oak (Grevillea robusta) trees to fill in gaps in the street lawns bordering parking areas on the west-side of Flagler Avenue, the north-side of Foote Avenue, and the west-side of Meigs Avenue.

17.4.3 Landscape Building 355 Front Entrance on Waianae Avenue. Provide landscaping to enhance and accentuate the entryway of the building.

17.4.4 Quadrangle C Signage. Provide lighted signage to identify “Quadrangle C”. Also, indicate its year of construction “Est. 1915". The sign architecture shall be compatible with the character of building 355. Minimum sign size 2.5 feet x 4 feet excluding base. Lettering shall be pin mounted. Place sign in an appropriate location along Waianae Avenue. Provide landscaping to accentuate signage.

17.4.5 Landscape Front Entryway Courtyards of Buildings 356, 357, and 358. Design an entrance space to the buildings that will accommodate and direct pedestrian traffic and create an atmosphere for socializing. Place more emphasis on the development of the center entryways and less on the side courtyards. As a minimum requirement, provide an informal grouping of a single-trunk type of palm species for the center entryways of each building. Each planting group shall consist of a minimum of 3 specimens. The same design shall be applied to the 3 buildings.

17.4.6 Foote Avenue Corridor Streetscape. Plant a minimum of 8 royal palm specimens in the street lawn fronting Foote on the south side of the parking lot west of building 356. The height of furnished palms shall match the 2 existing royal palms in the lawn. Provide a hedgerow to screen the parking lot with an allowance of 2 feet of car overhang into the planter strip.

17.4.7 Quad C Interior Court. Provide a minimum of 10 medium-sized canopy shade trees around the perimeter of the court that will complement the existing African Tulip tree located in the north corner. The tree species shall not be Kukui or Formosa Koa which are planted in the courts of the other quads.

17.4.8 Landscape Memorial. The memorial plaque is located at the east entry into the quad complex on Waianae Avenue. Provide paved sidewalk with a minimum width of 5 feet from the curbing to the plaque. Provide plantings to define and accentuate the memorial.

17.4.9 Screen Plantings. Provide plantings to screen unwanted views of trash enclosures, utility pad mounts, etc. that are outside of the AT/FP standoff zone of 33 feet from buildings.

17.4.10 Turf Plantings.

17.4.10.1 St. Augustine (*Stenotaphrum secundatum*): Establish grass around building 355, in center and side courtyards of buildings 356, 357, and 358 and in all other areas where sunlight conditions do not favor common bermuda grass growth.

17.4.10.2 Common Bermuda (*Cynodon dactylon*): Establish grass in the central court of the quad complex and in all other turf areas within the project site not planted with St. Augustine. Disturbed ground areas outside of the project area shall also be re-established with bermuda grass.

17.4.11 Tree Planting Material Requirements

17.4.11.1 Palm species: field stock, trunk height 10-20 feet, trunk unmarked with a diameter measurement not less than 6 inches along any point of the trunk. Specimens in a group planting shall have staggered heights. Suitable palm species are Alexander (Archontophoenix Alexandra), Joannis (Veitchia joannis), Fiji (Pritchardia pacifica), Princess (Dictyosperma album), Foxtail (Wodyetia bifurcata), Queen (Syagrus romanzoffianum), and Black (Normanbya normanbyi).

17.4.11.2 Medium-sized canopied shade tree (species not identified): pot size 25 gallons, trunk caliper not less than 2 inches, height not less than 8 feet.

17.4.12 Quality of Planting Material. All plant material furnished shall have a habit of growth that is normal for the species and shall be healthy and free from disease, insects and injuries. Trees and shrubs shall have well developed branching with vigorous root systems. Roots must fill containers, but show no evidence of being or having been root bound. Trunks shall be reasonably straight and symmetrical with crown and have a persistent main leader. Trees shall not be Apoled@ or the leader removed. Any tree or shrub with a weak, thin trunk not capable of supporting itself when planted in the open will be rejected. Plants shall equal or exceed measurements specified in the planting plan, which will be the minimum acceptable sizes after pruning. If any plant specified is not obtainable, submit a written substitution presenting either a different size of the same species or a similar alternate species. Substitutions of plant materials will not be permitted unless authorized.

17.4.13 Imported Screened Topsoil. New topsoil at a minimum of 6 inches deep shall be furnished for the newly planted areas in the front and side courtyards of buildings 650, 651, and 652. The topsoil shall be fertile, friable of loamy character, and amended with humus or composted organic material. The soil shall have passed through a 6.4 mm screen. The topsoil shall be free of weed seeds, other viable plant material such as nutgrass, stones, and other deleterious substances.

17.4.14 On-Site Topsoil. Except for the areas identified in paragraph above, all areas shall use the saved topsoil from the site. Soil tests shall be performed for pH, chemical analysis and mechanical analysis to establish the quantities and type of soil amendments required for the type and variety of plant material specified. The saved topsoil shall be amended per recommendations of the soil test. If the stored site=s topsoil is not sufficient to cover the landscaping needs, additional topsoil shall be provided by the contractor from an approved off site source.

17.4.15 Root Barriers. Root barriers shall be provided for new plantings of the broadleaf trees in the parking lots and streetscapes. In addition, provide root barriers for saved broadleaf trees located close to the pavements and foundations. Barriers shall be woven fabric, minimum 19.5 inches in width, with integral chemical nodules. Linear type of application method of the root barrier shall be used rather than encircling the tree root ball.

17.4.16 Landscape Edging. Bed dividers shall be provided to separate shrub beds, tree wells, and mulch treatments. Plastic header shall be flexible, resin-formulated edging 5.25 inches high and have a 1.12 inch diameter bead; designed with ribbed sides and a t-shaped bottom; heavy duty grade construction; and sun guarded, carbon black for UV protection.

17.4.17 Mulch Applications. Organic and/or inorganic mulch treatments shall be provided in shrub beds, planter wells, and in appropriate areas where it can serve as a cost-effective alternative to turf groundcover. As a minimum, organic mulch material shall be stable, fully composted green waste; gray to dark brown; no odor; ph 7-8; 80% of the material shall pass through a screen of 3 inches or smaller; and free of viable weed seeds, litter, and deleterious material.

17.4.18 Percolation Test. Test for percolation shall be performed to determine positive drainage of plant pits and beds. All soil and drainage conditions detrimental to the growth of plant materials shall be identified and a proposal correcting the conditions shall be submitted.

17.4.19 Installation of Plant Material. For tree pits in parking lots, minimum size of planting hole shall be 5 feet by 5 feet by 3 feet deep. Remove existing pavement, base course, and sub-base course and backfill with topsoil and compact to 70% of maximum density. When obstructions below ground or poor drainage affect the planting operation, proposed adjustments to plant location, type of plant and planting method or drainage correction shall be submitted. For all other plan pits, excavate and backfill as recommended by the trade and ANSI Z60.1.

17.4.20 Maintenance During Planting Operation. Installed plants shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences.

17.4.21 Maintenance During Establishment Period.

17.4.21.1 The maintenance period shall begin upon written acceptance of the planting operations and continue for 365 days thereafter. During this period, provide plants with optimum growing conditions and maintain the appearance of the planted areas.

17.4.21.2 The maintenance of plants shall include, but no limited to, straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, removing dead or excessive growth by pruning, maintaining edging of beds, checking for girdling of plants, watering, fertilizing, weeding, insects and diseases pest control, removing and replacing unhealthy plants and unsatisfactory turf areas, mowing turf, and removing plant and litter debris.

17.4.21.4 Restricted use pesticides shall not be utilized. All pesticide applications, regardless of pesticide application, shall be performed or supervised by personnel that are certified by the State of Hawaii to apply pesticides in the Ornamental Plants and Turf category.

17.4.22 Automatic Irrigation System.

17.4.22.1 Provide permanent fully automatic irrigation systems for the landscape and turf areas surrounding buildings 355, 356, 357, and 358; the central court of the quad; and the street lawn of the Quad C parking lot along Foote Avenue, Meigs Avenue, and Waianae Avenue.

17.4.22.2 A computer based controller(s) shall be provided with rain sensors. For the quad court, install Hunter I-40 rotor Pop-up with check valve and stainless steel riser (or equivalent) irrigation heads with triple-swing joint connection to the lateral.

17.4.22.3 Place main lines a minimum of 18 inches and laterals 12 inches below finished grade. Place pipes and electrical wiring crossing pavement at least 18 inches below finish grade at sidewalks and 2 feet below finish grade at roadways. Install electrical wiring below irrigation pipes for protection. Provide appropriately sized sleeves for all pipes going under sidewalks and roads.

17.4.23 Reserved.

17.4.24 Disposal of green waste material shall be outside the limits of Government property, and shall be the contractor=s responsibility. The contractor may at his option dispose of trees and shrubs by chipping the green waste and applying the material as a mulch layer 100 to 150 mm (4 to 6 in.) thick over bare ground surfaces of training grounds at Schofield Barracks to control soil erosion. The Director of Public Works, Schofield Barracks, will determine the location of the disposal site.

17.4.25 Warranty.

17.4.25.1 Furnished plant materials shall be guaranteed to be in a vigorous growing until completion of the maintenance period. Plants that decline or die during the warranty period shall be replaced using the same kind and size as originally planted. The warranty shall also apply to existing trees on the job site that are either saved in place or relocated (transplanted).

17.4.25.2 Furnished irrigation system shall be guaranteed to be in full operation during the maintenance period. Material and equipment found to be defective due to faulty material or workmanship shall be immediately repaired or replaced. The contractor is responsible for damage caused by the irrigation system during the installation or the warranty period due to failure of workmanship or materials.

## ATTACHMENTS

1 SIGN TYPES

2 WATER ANALYSIS

3 PLUMBING AND HVAC DESIGN ANALYSIS

4 COOLING LOAD CALCULATIONS, VAC EQUIPMENT SELECTION, PLUMBING CALCULATIONS, PLUMBING EQUIPMENT SELECTION, AND CENTRAL MECHANICAL PLANT

5 FIRE PROTECTION DESIGN ANALYSIS AND CALCULATIONS

6 FIRE ALARM SEQUENCE OF OPERATION MATRIX

7 EXCAVATION PERMIT

8 LANDSCAPE DESIGN ANALYSIS

9 BLAST AND PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT

10 SEISMIC EVALUATION AND REHABILITATION REPORT

11 FOOD SERVICE DESIGN ANALYSIS

12 FOOD SERVICE EQUIPMENT BROCHURES

13 SUSTAINABLE DESIGN SPIRIT CHECKLIST

14 RFP LIST OF DRAWINGS

15. PROPOSAL DATA SHEET

16. UFGS SECTION 13280A ASBESTOS ABATEMENT

17. UFGS SECTION 13281A LEAD HAZARD CONTROL ACTIVITIES

18. UNDERGROUND STORAGE TANK, PCB BALLAST, AND MERCURY LIGHT SWITCH INSPECTION FOR BLDGS. 355, 356, 357, AND 358

19. ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS. 357 AND 358

20. BLDG 358

21. ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS. 355 AND 356

22. BLDG. 356

23. WATER DISTRIBUTION ANALYSIS

24. TELECOMM DETAILS

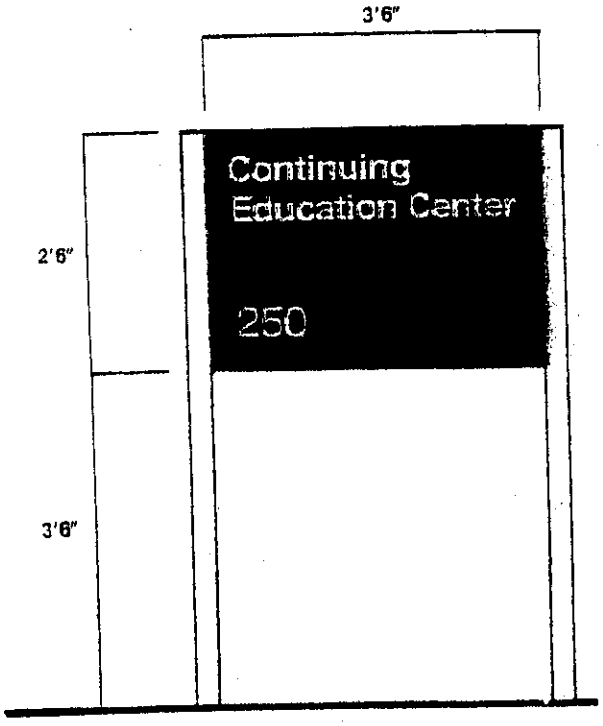
25. GEAR WASH/RECREATION BUILDING

26. PRELIMINARY SOILS REPORT

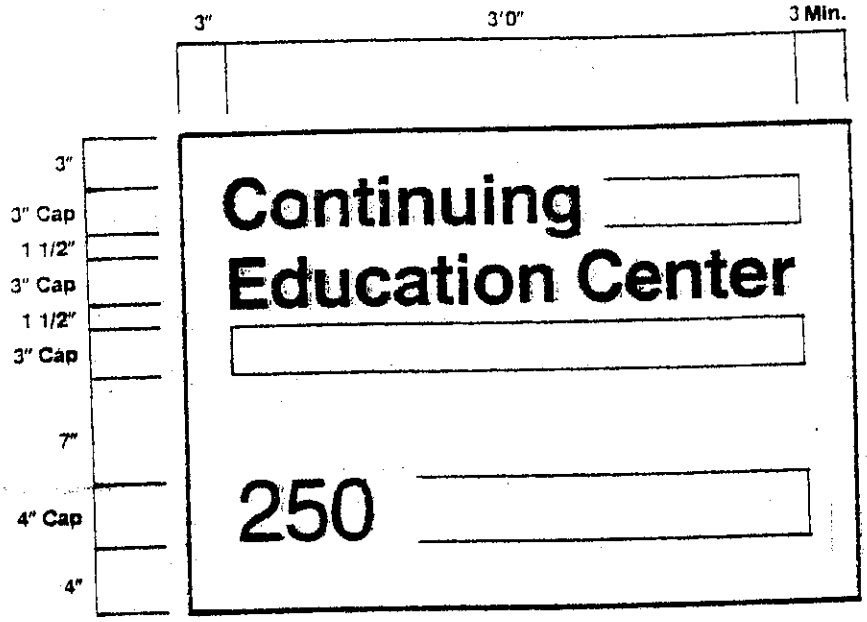
ATTACHMENT 1

SIGN TYPES

# SIGN TYPES




TYPE D4




TYPE D4

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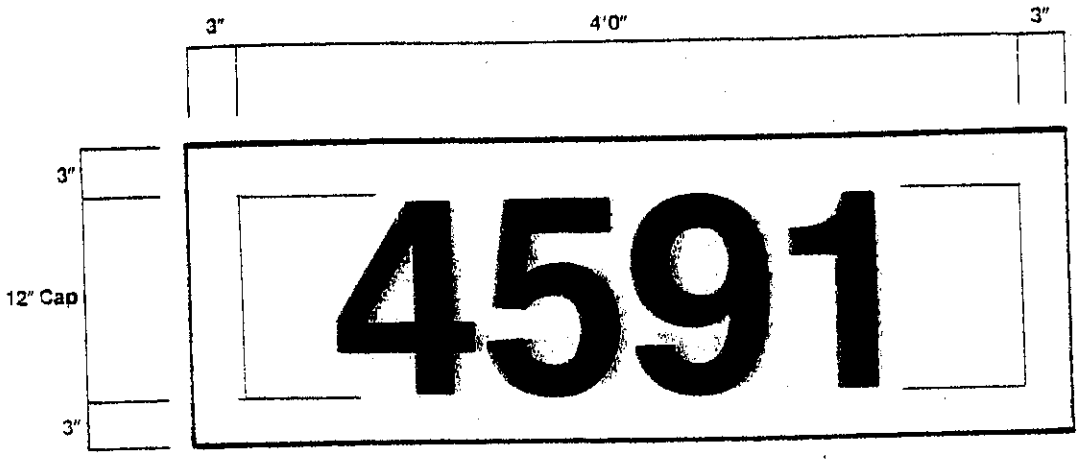
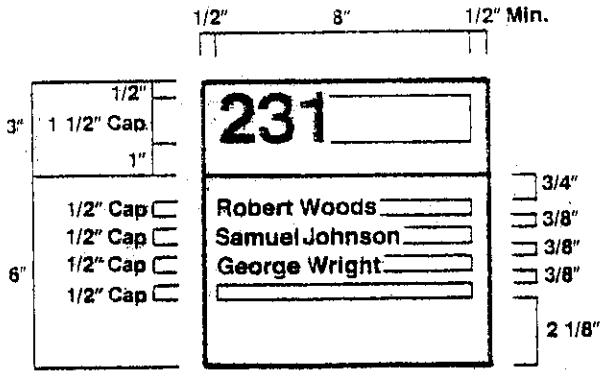



Sign grid 1, 1'6" H x 4'6" W sign panel

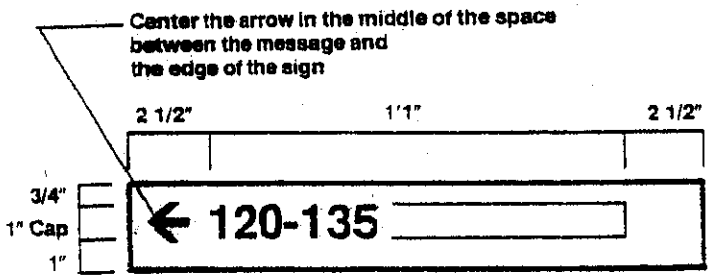
## TYPE C8



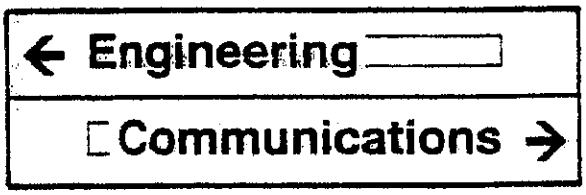

Sign grid, 9" H x 9" W sign panel

## TYPE BB2

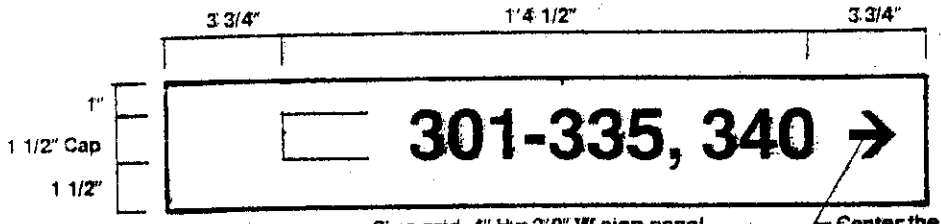
# SIGN TYPES




Sign grid 2 3/4" H x 1'6" W sign panel

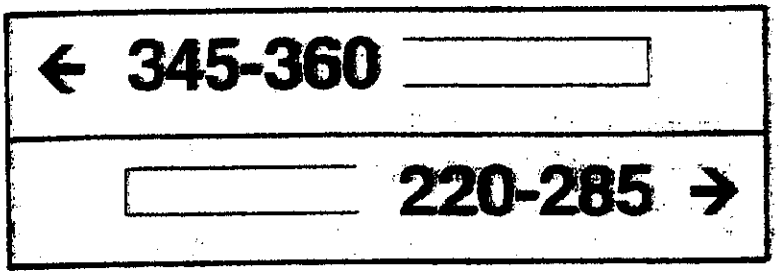



TYPE AA5



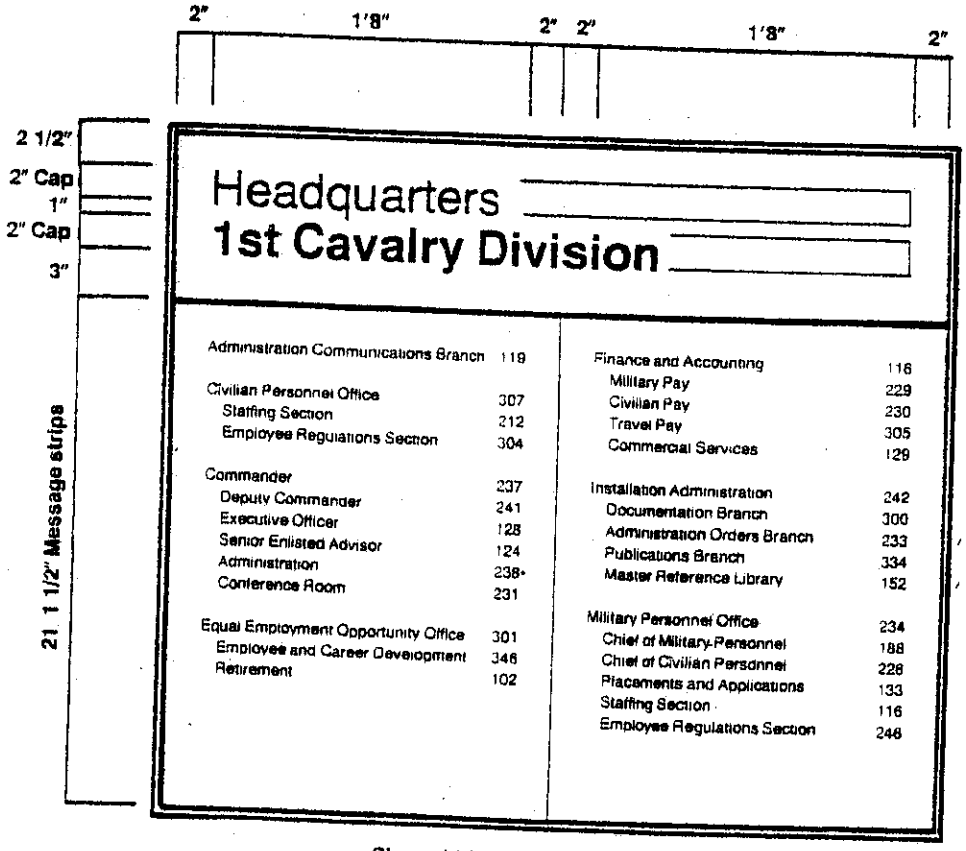

Sign grid, 4" H x 2'0" W sign panel

Center the arrow in the middle of the space between the message and the edge of the sign

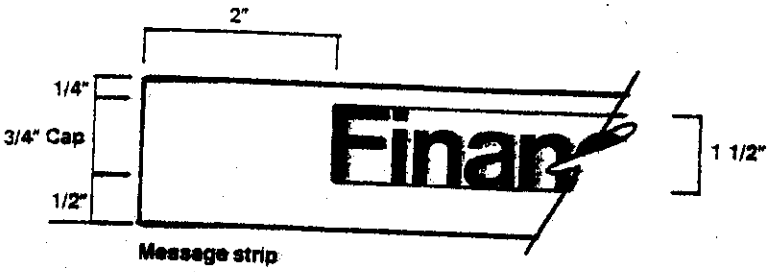



TYPE AA6

# SIGN TYPES




Sign grid 2, 3'6" H x 4'0" W sign panel




TYPE AA1

# ATTACHMENT 2

# WATER ANALYSIS

April 10, 2000

## Schofield Barracks - Water Analysis

| | | |
|---|---|---|
| Temperature | 75 | degrees F. |
| Silica (SiO 2) | 67 | ppm (mg/l) |
| Insoluble | — | ppm (mg/l) |
| Iron and Aluminum oxides | <0.01 | ppm (mg/l) |
| Calcium (Ca) | 10 | ppm (mg/l) |
| Magnesium (Mg) | 7.4 | ppm (mg/l) |
| Sodium and Potassium (Na and K) | 17 | ppm (mg/l) |
| Carbonate (HCO 3) | 63 | ppm (mg/l) |
| Sulfate (SO 4) | 5.5 | ppm (mg/l) |
| Chloride (Cl) | 20 | ppm (mg/l) |
| Nitrate (NO 3) | 5.5 | ppm (mg/l) |
| Turbidity | 0.02 | unit |
| pH | 6.9 | |
| Residual Chlorine | — | ppm (mg/l) |
| Total Alkalinity | 52 | epm (meq/l) |
| Non-Carbonate Hardness | 1.0 | epm (meq/l) |
| Total Hardness | 55 | epm (meq/l) |
| Dissolved Solids | 197 | ppm (mg/l) |
| Flourine | 0.03 | ppm (mg/l) |
| Conductivity | 213 | micrmho/cm |

ATTACHMENT 3

# PLUMBING AND HVAC DESIGN ANALYSIS

## A. DESIGN CRITERIA:

MIL-HDBK 1003/1: Plumbing Systems
MIL-HDBK-1003/3: Heating, Ventilating, Air Conditioning, and Dehumidifying Systems
MIL-HDBK-1040: Basic Guidelines for Chemical Warfare Hardening of New Military Facilities MIL-HDBK 1190: Facility Planning and Design Guide
TM 5-810-1 Heating Ventilating and Air Conditioning
TM 5-855-1 Design and Analysis of Hardened Structures to Conventional Weapons Effects
TM 5-785 Engineering Weather Data
TI 800-01 Technical Instructions
ETL 1110-3-483 Clothes Dryer Exhaust
International Plumbing Code - 2000 Ed.
Cameron Hydraulic Data, Ingersoll-Rand
ASHRAE 62-2001, Ventilation for Acceptable Indoor Air Quality
ASHRAE 15-2001, Safety Standards for Refrigeration Systems
ASHRAE Fundamentals - 2001 Ed.
ASHRAE Applications - 1995 Ed.
Americans with Disabilities Accessibility Guidelines
NFPA 90A, Installation of Air Conditioning and Ventilation Systems, 1996 Ed.
NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations, 2001 Ed.

## B. PLUMBING:

### General

The plumbing system will consist of domestic hot and cold water, sanitary sewer [drain, waste and vent (DWV)] and gas piping systems; new fixtures and related equipment.

Domestic Water System

Domestic water will be piped to the central mechanical plant at Quad C via a 6” (150 mm) main. Static water pressure of 47 psig, measured at the site by the fire protection engineer, is deemed to be insufficient for flush valve operation in office buildings however all water closets in the modules will be of the flush tank style to minimize noise. As a result, cold water will be boosted in pressure prior to supplying fixtures and equipment including gas fired water heaters for domestic and kitchen hot water systems. The water heating system will be housed in the central mechanical plant. An aboveground reduced pressure backflow preventer will be placed in the water supply.

Sanitary Sewage System

Sanitary waste will discharge to the site sanitary piping system. Greasy waste from the kitchen and dishwashing room will flow through 5,000 gal (18,925 L) grease interceptors prior to entering the site sanitary system. The criteria used to size the grease interceptor

is based on the Uniform Plumbing Code recommended sizing procedures in lieu of the City and County of Honolulu grease interceptor sizing standard. This criteria was chosen since it is based on actual flow. The City and County method is on based on fixture units only which will result in a smaller grease interceptor. Undersized grease interceptors will require frequent pumping and maintenance. Wastewater from the elevator pit will discharge directly into a holding tank in the elevator machine room where it will be serviced by elevator maintenance personnel.

Gas System

The existing gas piping serving Quad C originates from two existing 8,000 gallon tanks located near Building 472. The Design Build team shall coordinate with the Gas Company for locations of gas regulators, gas demand for each regulator and gas piping routing.

Plumbing Fixtures

All fixtures, faucets and flush valves will be of the water conservation type. Only fixtures in the battalion HQ and dining facility will be handicapped accessible in accordance with ADAAG. All other fixtures will not be of the accessible type. Exterior hose bibbs will be provided in limited quantities. Interior hose bibbs will be provided in restrooms.

Plumbing Requirements for Central Plant and Fire Pump Buildings

Floor drains, floor sinks and hose bibbs will be provided the Central Plant and Fire Pump Buildings.

**Hot Water System**

The hot water generating and storage system consists of two (2) heat pump units with circulating hot water pumps, two (2) gas fired, finned copper-tube instantaneous type water heaters with pumps, two (2) storage tanks and two (2) building hot water recirculating pumps. Heat pump units will extract heat from returning chilled water prior to the chillers and preheat domestic water in the hot water storage tanks. The gas heaters will provide the final boost in temperature to 140°F (60 °C). Hot water will be generated and stored at 140°F (60 °C) and tempered or boosted to satisfy specific temperature requirements at various fixtures and equipment.

Hot water in the kitchen and dining facility will be tempered to 100 °F (37.8°C) for hand sinks and lavatories in the employee toilets. 140°F (60°C) hot water will be supplied to the food preparation, vegetable preparation and pots and pans sinks in main kitchen. 180°F (82.2°C) hot water will also be supplied to the dishwashers, pots and pans rinse sinks and hose bibbs at the field feeding equipment room. An in-line electric booster heater will increase the temperature to 180°F (82.2°C) in these areas.

Hot water will be tempered to 100°F (37.8°C) at service sinks, showers, lavatories and kitchen sinks in the billeting and company operation areas. Shower valves will be of the

pressure balanced type with temperature setpoint capability to minimize the potential for scalding.

**Piping**

Water piping will be Type K, hard drawn copper for underground installations and Type L, hard drawn copper for above ground areas. Fittings for copper tubing will be cast bronze or copper with soldered ends using tin-antimony solder since lead solder is not permitted. Hot water piping will be insulated. Aboveground exterior insulation and underground insulation will be factory pre-insulated or insulated with cellular glass type insulation. Interior insulation will be rigid fiberglass with vapor barrier wrap.

Drainage, waste and vent (DWV) piping will be service weight cast iron with hub and spigot DWV fittings for underground installations and no-hub cast iron with hubless fittings for aboveground installations.

## C. AIR CONDITIONING:

**General**

The air conditioned areas include:

1. Offices
2. Classrooms
3. Conference rooms
4. Learning centers
5. Dining rooms
6. Kitchen
7. Dishwashing room
8. Game rooms
9. Modules (living units)
10. Interior corridors (buildings 356 & 358)
11. Arms vaults
12. Equipment maintenance areas
13. Communication storage rooms
14. Telecommunications rooms
15. Mechanical equipment rooms with microprocessor based controllers.
16. Lounges

The following rooms will not be air conditioned but will be mechanically ventilated:

1. Electrical rooms
2. Laundry rooms
3. Toilet and restrooms
4. Janitors closets

5. Unit storage rooms
6. NBC storage rooms
7. TA-50 rooms
8. Kitchen dry storage
9. Central mechanical plant building
10. Dining facility compressor room

The following rooms will not be air conditioned nor mechanically ventilated:

1. Fire control rooms
2. General storage rooms
3. Can wash room
4. Pulper room

The air conditioning system will not be on the emergency power circuit.

A temporary 150 ton air cooled packaged chiller, chilled water pump and piping will be provided for Building 355 since it will be occupied during a portion of the construction period until such time that it is vacated for renovation.

**Design Conditions**

All air conditioned spaces will be designed to provide 75°F (23.9°C) [+/-2°F (1.1°C)] room temperature with relative humidity at 50% +/-5%RH. Kitchens and dishwashing areas will be cooled to 85°F (29.4°C) [+/-2°F (1.1°C)] room temperature. Humidity control will not be provided in the kitchen and dishwashing areas.

Outdoor air requirements will be based on ASHRAE 62-1999 and will be 30 cfm (15 L/s) per room for bedrooms and living rooms, 20 cfm (10 L/s) per person in office areas, 15 cfm (7.50 L/s) per person in waiting rooms, 0.05 cfm/sf (0.25 L/s/sm) in corridors, and 0.25 L/s/sm (0.05 cfm/sf) in storage areas. Outdoor air will be supplied at a rate that makes up for toilet exhaust and maintains positive pressure in conditioned spaces.

Cooling loads will be based on weather data for Schofield Barracks, Hawaii as follows:

2.5% Summer Dry Bulb Temperature = 85°F (29.4°C)
Mean Coincident Wet Bulb Temperature = 74°F (23.3°C)
Prevailing Wind Direction = East

**HVAC Equipment and System**

Quad C will be cooled by two (2) nominal 200 ton water cooled chillers with each unit sized to handle roughly 50% of the peak cooling capacity. Two (2) chilled water pumps (one for each chiller) will distribute chilled water to air handling units in each building via insulated copper tubing for pipe sizes 4” (100 mm) and smaller and carbon steel pipe for pipe sizes larger than 4” (100 mm). Two (2) condenser water pumps (one for each

chiller) will circulate cooling water between the chillers and the cooling towers. A 100% back-up system was deemed to be unnecessary. The new cooling towers will be located in the existing cooling tower enclosure. The chillers, pumps, heat recovery and domestic hot water boilers and storage tanks will be located in a central plant building near the cooling tower for physical protection.

Exterior underground and aboveground chilled water piping will be factory pre-insulated and covered with PVC jacketing or insulated with cellular glass with PVC jacketing. Interior aboveground chilled water piping will be insulated with fiberglass insulation.

The chillers will be of the screw type to optimize operating efficiency. Low ozone depleting potential refrigerants will be specified.

The chilled and condenser water pumps will be of the constant volume type. Pumps and motors will be standard coupled and mounted on factory provided bent base frames on housekeeping pads. Check valves will be of the "non-slam" type. Three-way valves will be provided at the air handling units.

The cooling towers will be stainless steel or fiberglass types with variable speed or 2-speed fans.

The battalion headquarters spaces and the soldier community areas including the office spaces, conference rooms and open office areas will be cooled by a variable air volume (VAV) air conditioning system using multiple AHU's serving the various zones. The floor mounted AHU's will be located in mechanical rooms for ease of maintenance and repair. The Arms Vaults will be air conditioned by chilled water, ceiling suspended VAV fan coil units (FCU). The Communication Storage rooms will be air conditioned by chilled water, ceiling suspended CAV FCU's.

The company operation administration spaces including offices, conference rooms and open office areas will be air conditioned by CAV systems with multiple floor mounted AHU's serving various zones. The Arms Vaults will be air conditioned by a chilled water, ceiling suspended VAV fan coil unit (FCU) during occupied periods and dehumidified with a packaged, off-the-shelf desiccant dehumidifier during unoccupied periods. The Communication Storage rooms will be air conditioned by chilled water, ceiling suspended CAV FCU's.

The dining and kitchen facilities will be air conditioned by CAV AHU's. AHU's will be floor mounted and located in mechanical rooms. The organizational training areas in

Building 357 will be air conditioned by a VAV system. The office areas in Building 357 will be air conditioned by a CAV system.

The billeting modules will be air conditioned by central station chilled water air handling units with VAV boxes serving each living unit in order to dehumidify outdoor air and provide proper temperature control in each unit. Interior corridors, game rooms, and lounges in Buildings 356 and 358 will be air conditioned by central station AHU's with VAV boxes.

Integral horsepower motors for pumps and fans will be of the premium efficiency type.

**Peak Loads**

The estimated peak cooling loads for the buildings are as follows:

Building 355

Cooling : 60 Tons (211.0 KW)

Building 356

Cooling : 84 Tons (295.3 KW)

Building 357

Cooling : 142 Tons (499.4 KW)

Building 358

Cooling : 84 Tons (295.3 KW)

Total: 370 Tons (1,301 KW)

Use 400 Tons (1,406.4 KW) to allow for margin of safety.

**Air Distribution System**

The air distribution system will consist of VAV and CAV systems. Floor mounted AHU's and ceiling suspended FCU's will be utilized.

The AHU's will be modular, central station type, with insulated, double-walled construction and a solid inner wall for improved indoor air quality. VAV AHU's will be

equipped with solid state variable frequency drives (VFD) and isolation transformers. All AHU's will will be equipped with ultraviolet "C" (UV-C) lights to aid in keeping the coils free of mold and mildew.

All ductwork will be galvanized sheet metal, constructed in accordance with the Sheet Metal & Air Conditioning Contractor's National Association, Inc. (SMACNA) Duct Construction Standards and insulated with a minimum of 2" (50 mm) thick exterior foil faced, fiberglass duct wrap for improved indoor air quality (exterior insulation permits duct cleaning).

Air intakes will be located 10' above grade to comply with AT/FP requirements.

**Temperature Controls**

A direct digital control (DDC) system will control and monitor the air conditioning, ventilation and domestic hot water system. The DDC system will control the chillers, pumps, cooling towers, air handling units, control valves, water heaters and provide equipment diagnostics. Strategies such as chilled water temperature reset, leaving supply air temperature reset, and schedule optimization may be programmed into the DDC system to optimize and refine the air conditioning system operation to provide the necessary cooling with a minimum expenditure of energy.

The DDC system will be BACnet compatible to enable future tie-in to a base wide DDC system.

The master controller will be located in the central plant while the user interface panel or personal computer will be located in one of the offices.

The DDC system will allow central shut down of the air distribution system as required by ATFP Guidelines.

All equipment will tie into it respective individual controller to permit stand alone operation in the case of failure of the master controller.

<u>VAV Control</u>

Microprocessor-based, wall mounted thermostats will measure space temperature and regulate their respective VAV box serving that space. Each thermostat will be provided with user adjustable occupied and unoccupied period setpoints. The 3-way chilled water valve in the air handling unit will modulate to maintain a supply air temperature of 55°F (12.8°C). The VAV boxes will modulate air flow to the space to maintain the desired room setpoint temperature.

<u>CAV Control</u>

A microprocessor-based, wall mounted thermostat will measure space temperature and modulate the 3-way chilled water valves at the air handling units to maintain a return air temperature of 75°F (23.9°C). Fan coil units will be provided with 2-position 3-way chilled water valves. The thermostat will be provided with user adjustable occupied and unoccupied period setpoints.

## D. VENTILATION/EXHAUST:

### Administrative and Office Areas

Restrooms and janitor closets within the administrative and office areas will be ventilated by transferring air from adjacent air conditioned areas and exhausting by ceiling mounted cabinet exhaust fans through the roof. The exhaust fans will be interlocked with their respective air handling unit to remove excess air.

### Electrical and Storage Rooms

The electrical rooms and storage areas will be ventilated by introducing outside air through wall louvers and exhausting by cabinet fans through exterior walls or roof.

### Mechanical Rooms

Mechanical rooms will be ventilated by transferring air from adjacent air conditioned areas. Excess air will be exfiltrated through exterior walls or door louvers.

### Dining Facility

Kitchen exhaust hoods with a hot water washdown and chemical fire protection system will be provided over grease generating and heat producing equipment. Pre-conditioned makeup air will be provided by floor mounted central station air handling units to cool the individual spaces. Dishwashing room will be ventilated by ceiling mounted cabinet exhaust fans. Steam exhaust hoods will be provided over dishwashers, pot and pan washers and pots and pans sinks. Exhaust air will be ducted through the upper floors and through the roof of the building. Air curtain fly-control units will be installed over personnel entrance and exit doors into the dining and kitchen areas.

### Dining Facility Compressor Room

Room housing the compressors for the walk-in reefers will be ventilated by transferring air from adjacent areas and exhausted by cabinet fans through exterior walls. Ventilation shall comply with ASHRAE 15-2001 in the event of a refrigerant leak.

### Billeting Modules

Bathrooms in the modules will be ventilated by transferring air from adjacent rooms and exhausting through ceiling centrifugal exhaust fans through the roof. A residential style kitchen hood will be provided over the cook tops and exhausted through the roof. Penetrations into vertical duct shafts will be protected with fire dampers. Clothes dryer exhaust will be ducted to the exterior and assisted by exhaust fans to comply with ETL 1110-3-483. Laundry areas will be ventilated by transferring air from adjacent air conditioned areas. Laundry areas and janitor closets will be exhausted to the exterior via cabinet fans.

**Central Mechanical Plant Building**

Central mechanical plant building will be ventilated by introducing outside air through wall louvers and exhausting through exterior wall mounted exhaust fans. Ventilation shall comply with ASHRAE 15-2001 in the event of a refrigerant leak.

ATTACHMENT 4

# COOLING LOAD CALCULATIONS, VAC EQUIPMENT SELECTION, PLUMBING CALCULATIONS, PLUMBING EQUIPMENT SELECTION, AND CENTRAL MECHANICAL PLANT

# COOLING LOAD CALCULATIONS

# Cooling Load Summary

Building 355

First Floor: 23 Tons (80.8 KW)
Second Floor: 19 Tons (66.8 KW)
Third Floor: 18 Tons (63.3 KW)

Total: 60 Tons (211.0 KW)

Building 356

First Floor: 28 Tons (98.4 KW)
Second Floor: 28 Tons (98.4 KW)
Third Floor: 28 Tons (101.9 KW)

Total: 84 Tons (295.3 KW)

Building 357

First Floor: 50 Tons (175.8 KW)
Second Floor: 18 Tons (63.3 KW)
Third Floor: 38 Tons (133.6 KW)

Total: 142 Tons (499.4 KW)

Building 358

First Floor: 28 Tons (98.4 KW)
Second Floor: 28 Tons (98.4 KW)
Third Floor: 28 Tons (101.9 KW)

Total: 84 Tons (295.3 KW)

Grand Total: 370 Tons (1,301.0 KW)

**PROJECT:** WHOLE BARRACKS RENEWAL, QUAD C
SCHOFIELD BARRACKS, OAHU, HAWAII
**TEC JOB NO.:** 02030
**DESIGNED BY:** TEC
**PREPARED BY:** TEC
**DATE:** 10/17/2002

**UNIT SELECTION**

| ZONE / SPACE NAME | AREA (SQ.FT.) | SF/TON | TONS |
|---|---|---|---|
| **BUILDING 355 - FIRST FLOOR** | | | |
| **ZONE LEFT** | | | |
| COM STORAGE | 160 | 425.00 | 0.38 |
| EQUIPMENT MAINTENANCE | 710 | 425.00 | 1.67 |
| ARMS VAULT | 557 | 425.00 | 1.31 |
| TELECOM | 110 | 425.00 | 0.26 |
| UNIT STORAGE | 546 | 425.00 | 1.28 |
| EQUIPMENT MAINTENANCE | 716 | 425.00 | 1.68 |
| ARMS VAULT | 557 | 425.00 | 1.31 |
| COM STORAGE | 179 | 425.00 | 0.42 |
| ARMS VAULT | 559 | 425.00 | 1.32 |
| COM STORAGE | 187 | 425.00 | 0.44 |
| EQUIPMENT MAINTENANCE | 717 | 425.00 | 1.69 |
| SUBTOTAL: | 4,998 | 425 | 12 |
| **ZONE RIGHT** | | | |
| EQUIPMENT MAINTENANCE | 793 | 425.00 | 1.87 |
| ARMS VAULT | 557 | 425.00 | 1.31 |
| COM STORAGE | 187 | 425.00 | 0.44 |
| ARMS VAULT | 557 | 425.00 | 1.31 |
| COM STORAGE | 179 | 425.00 | 0.42 |
| EQUIPMENT MAINTENANCE | 716 | 425.00 | 1.68 |
| TELECOM | 110 | 425.00 | 0.26 |
| ARMS VAULT | 557 | 425.00 | 1.31 |
| EQUIPMENT MAINTENANCE | 710 | 425.00 | 1.67 |
| COM STORAGE | 160 | 425.00 | 0.38 |
| SUBTOTAL: | 4,526 | 425 | 11 |
| **BUILDING 355 - SECOND FLOOR** | | | |
| **ZONE LEFT** | | | |
| PLATOON OFFICE | 160 | 425.00 | 0.38 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| COMMANDER OFFICE | 153 | 425.00 | 0.36 |
| EXECUTIVE OFFICE | 101 | 425.00 | 0.24 |
| TRAINING OFFICE | 102 | 425.00 | 0.24 |
| ADMIN OFFICE | 396 | 425.00 | 0.93 |
| FIRST SARGENT | 119 | 425.00 | 0.28 |
| WAITING | 185 | 425.00 | 0.44 |
| CONFERENCE ROOM | 355 | 425.00 | 0.84 |
| TELECOM | 111 | 425.00 | 0.26 |
| SUBTOTAL: | 2,297 | 425 | 5 |
| **ZONE MIDDLE LEFT** | | | |
| TELECOM | 70 | 365.00 | 0.19 |
| CLASSROOM | 692 | 365.00 | 1.90 |
| CLASSROOM | 692 | 365.00 | 1.90 |
| SUBTOTAL: | 1,454 | 365 | 4 |
| **ZONE MIDDLE RIGHT** | | | |
| PLATOON OFFICE | 120 | 425.00 | 0.28 |
| PLATOON OFFICE | 120 | 425.00 | 0.28 |
| PLATOON OFFICE | 122 | 425.00 | 0.29 |
| PLATOON OFFICE | 122 | 425.00 | 0.29 |
| COMMANDER OFFICE | 155 | 425.00 | 0.36 |
| EXECUTIVE OFFICE | 98 | 425.00 | 0.23 |
| TRAINING OFFICE | 100 | 425.00 | 0.24 |
| FIRST SARGENT | 118 | 425.00 | 0.28 |
| ADMIN OFFICE | 363 | 425.00 | 0.85 |
| TELECOM | 70 | 425.00 | 0.16 |
| WAITING | 344 | 425.00 | 0.81 |
| CONFERENCE ROOM | 361 | 425.00 | 0.85 |
| SUBTOTAL: | 2,093 | 425 | 5 |
| **ZONE RIGHT** | | | |
| CONFERENCE ROOM | 361 | 425.00 | 0.85 |
| WAITING | 207 | 425.00 | 0.49 |
| FIRST SARGENT | 118 | 425.00 | 0.28 |
| ADMIN OFFICE | 410 | 425.00 | 0.96 |
| TRAINING OFFICE | 100 | 425.00 | 0.24 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OFFICE | 123 | 425.00 | 0.29 |
| PLATOON OPEN OFFICE | 243 | 425.00 | 0.57 |
| PLATOON OFFICE | 124 | 425.00 | 0.29 |
| PLATOON OFFICE | 124 | 425.00 | 0.29 |
| EXECUTIVE OFFICE | 98 | 425.00 | 0.23 |
| COMMANDER OFFICE | 155 | 425.00 | 0.36 |
| SUBTOTAL: | 2,186 | 425 | 5 |

| ZONE NAME | SF/TON | TONS |
|---|---|---|
| MEDIUM COMPANY OPS | 425 | 7 |
| CLASSROOMS 1 | 365 | 5 |
| BATTALION HEADQUARTERS | 485 | 12.00 |
| LARGE COMPANY OPS | 450 | 9.00 |
| KITCHEN OFFICES | 355 | 1.50 |
| KITCHEN | 55 | 50.00 |
| DINING AREA | 400 | 24.00 |
| LOUNGE | 465 | 10.00 |
| CLASSROOMS 2 | 300 | 25.00 |
| 1+1 UNIT 1ST FLOOR | 405 | 1.00 |
| 1+1 UNIT 3RD FLOOR | 380 | 1.00 |
| SINGLE UNIT 1ST FLOOR | 310 | 0.60 |
| SINGLE UNIT 3RD FLOOR | 295 | 0.65 |
| DISHWASHING ROOM | 60 | 12.00 |

| | |
|---|---|
| PROJECT: | WHOLE BARRACKS RENEWAL, QUAD C<br>SCHOFIELD BARRACKS, OAHU, HAWAII |
| TEC JOB NO.: | 02030 |
| DESIGNED BY: | TEC |
| PREPARED BY: | TEC |
| DATE: | 10/17/2002 |

UNIT SELECTION

| ZONE / SPACE NAME | AREA SQ FT | SF/TON | TONS |
|---|---|---|---|
| **BUILDING 355 - THIRD FLOOR** | | | |
| **ZONE LEFT** | | | |
| CLASSROOM | 794 | 485.00 | 1.64 |
| CLASSROOM | 848 | 485.00 | 1.75 |
| DUTY OFFICE | 110 | 485.x0 | 0.23 |
| TELECOM | 90 | 485.x0 | 0.19 |
| MESSAGE CENTER | 198 | 485.00 | 0.41 |
| CONFERENCE ROOM | 493 | 485.00 | 1.02 |
| EXECUTIVE OFFICE | 173 | 485.00 | 0.36 |
| COMMANDER OFFICE | 235 | 485.00 | 0.48 |
| S-1/OFFICE | 100 | 485.00 | 0.21 |
| RECEPTION | 138 | 485.00 | 0.28 |
| WAITING | 80 | 485.00 | 0.16 |
| CSM | 162 | 485.00 | 0.33 |
| OPEN OFFICE | 701 | 485.00 | 1.45 |
| COFFEE | 60 | 485.00 | 0.12 |
| SUBTOTAL: | 4,182 | 485 | 9 |
| **ZONE RIGHT** | | | |
| CLASSROOM | 692 | 485.00 | 1.43 |
| CLASSROOM | 692 | 485.00 | 1.43 |
| S-3 | 1,007 | 485.00 | 2.08 |
| TELECOM | 90 | 485.00 | 0.19 |
| SUPPLIES | 137 | 485.00 | 0.28 |
| OFFICE | 104 | 485.00 | 0.21 |
| OFFICE | 104 | 485.00 | 0.21 |
| S-4 | 732 | 485.00 | 1.51 |
| S-2 | 502 | 485.00 | 1.04 |
| OFFICE | 106 | 485.00 | 0.22 |
| OFFICE | 106 | 485.00 | 0.22 |
| OFFICE | 107 | 485.00 | 0.22 |
| CRYPTO STORAGE | 201 | 485.00 | 0.41 |
| SUBTOTAL: | 4,580 | 485 | 9 |
| TOTAL (BLDG 355): | 26,316 | | 60 |
| **BUILDING 356 - FIRST FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 310.00 | 3.45 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 405.00 | 19.88 |
| SUBTOTAL: | 10,856 | 386 | 28 |
| **BUILDING 356 - SECOND FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 310.00 | 3.45 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 405.00 | 19.88 |
| SUBTOTAL: | 10,856 | 386 | 28 |
| **BUILDING 356 - THIRD FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 295.00 | 3.62 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 380.00 | 21.19 |
| SUBTOTAL: | 10,856 | 379 | 29 |
| TOTAL (BLDG 356): | 32,568 | | 84 |
| **BUILDING 357 - FIRST FLOOR** | | | |
| **ZONE LEFT** | | | |
| DINING AREA | 9,500 | 400.00 | 23.75 |
| DISHWASHING ROOM | 700 | 60.00 | 11.67 |
| SUBTOTAL: | 10,200 | 460 | 35 |
| **ZONE RIGHT** | | | |
| KITCHEN | 2,671 | 55.00 | 48.56 |
| COMM | 148 | 400.00 | 0.37 |
| OFFICE | 100 | 335.00 | 0.30 |
| OFFICE | 110 | 335.00 | 0.33 |
| OFFICE STORAGE | 220 | 335.00 | 0.66 |
| SUBTOTAL: | 3,249 | 292 | 50 |
| **BUILDING 357 - SECOND FLOOR** | | | |
| **ZONE LEFT** | | | |
| PLATOON OFFICE | 120 | 425.00 | 0.28 |
| PLATOON OFFICE | 120 | 425.00 | 0.28 |
| PLATOON OFFICE | 121 | 425.00 | 0.28 |
| PLATOON OFFICE | 121 | 425.00 | 0.28 |
| COMMANDER OFFICE | 172 | 425.00 | 0.40 |
| FIRST SARGENT | 151 | 425.00 | 0.36 |
| ADMIN OFFICE | 168 | 425.00 | 0.40 |
| EXECUTIVE OFFICE | 110 | 425.00 | 1.26 |
| WAITING | 265 | 425.00 | 1.62 |
| TRAINING OFFICE | 110 | 425.00 | 1.26 |
| CONFERENCE ROOM | 535 | 425.00 | 1.26 |
| TELECOM | 110 | 425.00 | 1.26 |
| SUBTOTAL: | 2,103 | 425 | 5 |

| | |
|---|---|
| **PROJECT:** | WHOLE BARRACKS RENEWAL, QUAD C<br>SCHOFIELD BARRACKS, OAHU, HAWAII |
| **TEC JOB NO.:** | 12030 |
| **DESIGNED BY:** | TEC |
| **PREPARED BY:** | TEC |
| **DATE:** | 10/17/2012 |

**UNIT SELECTION**

| ZONE / SPACE NAME | AREA SQ.FT. | SF/TON | TONS |
|---|---|---|---|
| **ZONE MIDDLE** | | | |
| CONFERENCE ROOM | 402 | 450.00 | 1.89 |
| WAITING | 256 | 450.00 | 0.57 |
| TRAINING OFFICE | 105 | 450.00 | 0.23 |
| EXECUTIVE OFFICE | 105 | 450.00 | 0.23 |
| PLATOON OFFICE | 122 | 450.00 | 0.27 |
| PLATOON OFFICE | 122 | 450.00 | 0.27 |
| PLATOON OFFICE | 122 | 450.00 | 0.27 |
| PLATOON OFFICE | 122 | 450.00 | 0.27 |
| FIRST SARGENT | 145 | 450.00 | 0.32 |
| COMMANDER OFFICE | 158 | 450.00 | 0.35 |
| PHYSICIANS AID | 122 | 450.00 | 0.27 |
| MEDICAL WAITING | 260 | 450.00 | 0.58 |
| TRIAGE | 143 | 450.00 | 0.32 |
| EXAM | 459 | 450.00 | 1.02 |
| SUBTOTAL: | 2,643 | 450 | 6 |
| **ZONE RIGHT** | | | |
| TELECOM | 110 | 450.00 | 0.24 |
| WAITING | 256 | 450.00 | 0.57 |
| CONFERENCE ROOM | 402 | 450.00 | 0.89 |
| TRAINING OFFICE | 105 | 450.00 | 0.23 |
| EXECUTIVE OFFICE | 105 | 450.00 | 0.23 |
| ADMIN OFFICE | 266 | 450.00 | 0.59 |
| S-1 OFFICER | 122 | 450.00 | 0.27 |
| S-1/PAC | 334 | 450.00 | 0.74 |
| FIRST SARGENT | 145 | 450.00 | 0.32 |
| SUPPLY OFFICER | 122 | 450.00 | 0.27 |
| MEDS | 29 | 450.00 | 0.06 |
| COMMANDER OFFICE | 158 | 450.00 | 0.35 |
| MED WAITING | 260 | 450.00 | 0.58 |
| EO OFFICER | 122 | 450.00 | 0.27 |
| EXAM | 459 | 450.00 | 1.02 |
| TRIAGE | 143 | 450.00 | 0.32 |
| PHYSICIANS AID | 122 | 450.00 | 0.27 |
| SUBTOTAL: | 3,260 | 450 | 7 |
| **BUILDING 357 - THIRD FLOOR** | | | |
| **ZONE LEFT** | | | |
| ASST CHAPLIN | 127 | 465.00 | 0.27 |
| ASST CHAPLIN | 127 | 465.00 | 0.27 |
| ASST CHAPLIN | 127 | 465.00 | 0.27 |
| CHAPLIN | 158 | 465.00 | 0.34 |
| CHAPLIN | 158 | 465.00 | 0.34 |
| ASST CHAPLIN | 120 | 465.00 | 0.26 |
| ASST CHAPLIN | 120 | 465.00 | 0.26 |
| CHAPLIN | 158 | 465.00 | 0.34 |
| LC | 2,051 | 465.00 | 4.41 |
| TELECOM | 110 | 465.00 | 0.24 |
| SUBTOTAL: | 3,256 | 465 | 7 |
| **ZONE MIDDLE** | | | |
| CLASSROOM NO. 1 | 958 | 300.00 | 3.19 |
| CLASSROOM NO. 2 | 936 | 300.00 | 3.12 |
| CLASSROOM NO. 3 | 832 | 300.00 | 2.77 |
| OPEN LEGAL OFFICE | 539 | 300.00 | 1.80 |
| LEGAL OFFICE | 115 | 300.00 | 0.38 |
| CLASSROOM NO. 4 | 1,460 | 300.00 | 4.87 |
| CLASSROOM NO. 5 | 1,115 | 300.00 | 3.72 |
| CLASSROOM NO. 6 | 948 | 300.00 | 3.16 |
| TELECOM | 110 | 300.00 | 0.37 |
| SUBTOTAL: | 7,013 | 300 | 23 |
| **ZONE RIGHT** | | | |
| SITTING ROOM | 230 | 465.00 | 0.49 |
| TV LOUNGE | 429 | 465.00 | 0.92 |
| SITTING ROOM | 1,515 | 465.00 | 3.26 |
| KITCHEN | 225 | 465.00 | 0.48 |
| VENDING | 83 | 465.00 | 0.18 |
| FRONT DESK | 62 | 465.00 | 0.13 |
| OFFICE | 178 | 465.00 | 0.38 |
| MAIL ROOM | 129 | 465.00 | 0.28 |
| PHONES | 119 | 465.00 | 0.26 |
| ACTIVITY | 783 | 465.00 | 1.68 |
| SUBTOTAL: | 3,753 | 465 | 8 |
| TOTAL (BLDG 357): | 35,477 | | 142 |

| | |
|---|---|
| PROJECT: | WHOLE BARRACKS RENEWAL, QUAD C<br>SCHOFIELD BARRACKS, OAHU, HAWAII |
| TEC JOB NO.: | 02030 |
| DESIGNED BY: | TEC |
| PREPARED BY: | TEC |
| DATE: | 10/17/2002 |

UNIT SELECTION

| ZONE / SPACE NAME | AREA (SQ FT) | SF/TON | TONS |
|---|---|---|---|
| **BUILDING 358 - FIRST FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 310.00 | 3.45 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 405.00 | 19.88 |
| SUBTOTAL: | 10,856 | 386 | 28 |
| **BUILDING 358 - SECOND FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 310.00 | 3.45 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 405.00 | 19.88 |
| SUBTOTAL: | 10,856 | 386 | 28 |
| **BUILDING 358 - THIRD FLOOR** | | | |
| GAME ROOM | 758 | 400.00 | 1.90 |
| GAME ROOM | 758 | 400.00 | 1.90 |
| TELECOM | 110 | 400.00 | 0.28 |
| TELECOM | 110 | 400.00 | 0.28 |
| SINGLE UNIT (TYP OF 6) | 1,068 | 295.00 | 3.62 |
| 1+1 UNIT (TYP OF 22) | 8,052 | 380.00 | 21.19 |
| SUBTOTAL: | 10,856 | 379 | 29 |
| TOTAL (BLDG 358): | 32,568 | | 84 |
| GRAND TOTAL: | 126,929 | | 370 |

# BATTALION HEADQUARTERS
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Battalion Headquarters 10-17-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE
   - Zone Name = Battalion Headquarters
   - Job Name = Barracks Renewal Quad C
   - Zone Type = 1 (Normal Zone)

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

   COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

   HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

   SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

   SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

   HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

   SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

   SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

   EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

   RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

   COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 3 Battalion Headquarters | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 10-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:
Zone Name : Battalion Headquarters Calc Time: Jun 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 82.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Battalion Headquarters | x 1 | 7.70 | 4,414.5 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Battalion Headquarters Calc Time: Jun 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 82.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 13,856 | 0 |
| GLASS TRANSMISSION | 267 | 0 |
| WALL TRANSMISSION | 9,158 | 0 |
| ROOF TRANSMISSION | 9,585 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 13,032 W TOTAL) | 37,190 | 0 |
| OTHER ELEC. ( 5,000 W TOTAL) | 15,573 | 0 |
| PEOPLE ( 35.00 PEOPLE TOTAL) | 6,831 | 7,175 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 92,459 | 7,175 |
| NET VENTILATION LOAD ( 700 CFM) | 5,425 | 23,258 |
| SUPPLY FAN LOAD (BHP= 2.6) | 6,545 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 104,428 | 30,433 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 76.2/ 63.9 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 | deg F |
| COIL SENSIBLE LOAD | = | 104,428 | BTU/hr |
| COIL TOTAL LOAD | = | 134,861 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 4,414 | CFM |
| TOTAL COOLING CFM (std. air) | = | 4,281 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 47.0 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.4 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 11.24 | Tons |
| | = | 483.16 | sqft/Tons |
| TOTAL FLOOR AREA | = | 5,430.00 | sqft |
| OVERALL U-FACTOR | = | 0.095 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.81 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Battalion Headquarters Calc Time: Jun 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 82.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 288 | 188 | 8,492 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 48 | 31 | 1,570 |
| | W | 0 | 0 | 0 |
| | NW | 72 | 47 | 3,795 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 1,440 | 4,438 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 1,440 | 2,934 | - |
| | W | 0 | 0 | - |
| | NW | 720 | 1,785 | - |
| | N | 0 | 0 | - |

**********

# MEDIUM COMPANY OPS
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Medium Company Ops 10-17-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Medium Company Ops |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 1 Medium Company Ops | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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6063092204
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**********

CALCULATION DATA:
Zone Name : Medium Company Ops
Job Name : Barracks Renewal Quad C

Calc Time: Jul 1700h
Amb db/wb: 83.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Medium Company Ops | x 1 | 4.55 | 2,605.6 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Medium Company Ops Calc Time: Jul 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 83.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 11,694 | 0 |
| GLASS TRANSMISSION | 260 | 0 |
| WALL TRANSMISSION | 7,675 | 0 |
| ROOF TRANSMISSION | 5,011 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 6,720 W TOTAL) | 19,177 | 0 |
| OTHER ELEC. ( 2,200 W TOTAL) | 6,852 | 0 |
| PEOPLE ( 20.00 PEOPLE TOTAL) | 3,903 | 4,100 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 54,573 | 4,100 |
| NET VENTILATION LOAD ( 400 CFM) | 3,519 | 12,892 |
| SUPPLY FAN LOAD (BHP= 1.5) | 3,863 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 61,954 | 16,992 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 76.3/ 63.8 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 | deg F |
| COIL SENSIBLE LOAD | = | 61,954 | BTU/hr |
| COIL TOTAL LOAD | = | 78,946 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 2,606 | CFM |
| TOTAL COOLING CFM (std. air) | = | 2,527 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 46.9 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.4 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 6.58 | Tons |
| | = | 425.61 | sqft/Tons |
| TOTAL FLOOR AREA | = | 2,800.00 | sqft |
| OVERALL U-FACTOR | = | 0.105 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.93 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Medium Company Ops Calc Time: Jul 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 83.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 168 | 130 | 4,692 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 96 | 74 | 3,400 |
| | W | 0 | 0 | 0 |
| | NW | 72 | 56 | 3,602 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 1,104 | 3,355 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 1,104 | 2,509 | - |
| | W | 0 | 0 | - |
| | NW | 732 | 1,811 | - |
| | N | 0 | 0 | - |

**********

# LARGE COMPANY OPS
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Large Company Ops
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Large Company Ops |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 4 Large Company Ops | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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6063092204
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**********

CALCULATION DATA:
Zone Name : Large Company Ops
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Large Company Ops | x 1 | 6.62 | 3,792.8 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

10-17-02
6063092204


Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

**********

CALCULATION DATA:
Zone Name : Large Company Ops
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 17,098 | 0 |
| GLASS TRANSMISSION | 390 | 0 |
| WALL TRANSMISSION | 8,568 | 0 |
| ROOF TRANSMISSION | 6,867 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 9,475 W TOTAL) | 27,039 | 0 |
| OTHER ELEC. ( 5,000 W TOTAL) | 15,573 | 0 |
| PEOPLE ( 20.00 PEOPLE TOTAL) | 3,903 | 4,100 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 79,439 | 4,100 |
| NET VENTILATION LOAD ( 400 CFM) | 3,519 | 13,118 |
| SUPPLY FAN LOAD (BHP= 2.2) | 5,623 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 88,580 | 17,218 |

**********

COIL SELECTION PARAMETERS:

| | | |
|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 75.9/ 63.0 deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 deg F |
| COIL SENSIBLE LOAD | = | 88,580 BTU/hr |
| COIL TOTAL LOAD | = | 105,798 BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 deg F |
| TOTAL COOLING CFM (actual) | = | 3,793 CFM |
| TOTAL COOLING CFM (std. air) | = | 3,678 CFM |
| RESULTING ROOM REL. HUMIDITY | = | 46.3 % |
| COIL BYPASS FACTOR | = | 0.050 |
| COIL APPARATUS DEWPOINT | = | 52.4 deg F |
| REHEAT REQUIRED | = | 0 BTU/hr |

**********

GENERAL INFORMATION:

| | | |
|---|---|---|
| TOTAL COOLING LOAD | = | 8.82 Tons |
| TOTAL FLOOR AREA | = | 447.80 sqft/Tons |
| OVERALL U-FACTOR | = | 3,948.00 sqft |
| COOLING CFM/sqft | = | 0.100 BTU/hr/sqft/F |
| | = | 0.96 CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Large Company Ops
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 192 | 149 | 4,486 |
| | E | 0 | 0 | 0 |
| | SE | 48 | 37 | 1,257 |
| | S | 0 | 0 | 0 |
| | SW | 264 | 204 | 11,355 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 1,284 | 3,362 | 0 |
| | E | 0 | 0 | - |
| | SE | 588 | 1,782 | - |
| | S | 0 | 0 | - |
| | SW | 1,284 | 3,424 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# CLASSROOMS 1
# PEAK COOLING LOAD

ZONE DESCRIPTION



Zone Name : Classrooms 1
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Classrooms 1 |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

| | | |
|---|---|---|
| COOLING EQUIPMENT | | |
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |
| HEATING EQUIPMENT | | |
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

| | | |
|---|---|---|
| SUPPLY AIR | | |
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |
| VENTILATION AIR | | |
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |
| SAFETY FACTOR | | |
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

| | | |
|---|---|---|
| HEATING SOURCE | | |
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |
| VENTILATION AIR | | |
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |
| SAFETY FACTOR | | |
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

| | | |
|---|---|---|
| SUPPLY FAN | | |
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |
| EXHAUST AIR | | |
| Direct exhaust air flow rate | = | 0 % of vent. air |
| RETURN AIR | | |
| Is a return plenum used | = | N |
| COIL DATA | | |
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 2 Classrooms 1 | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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6063092204
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**********

CALCULATION DATA:
Zone Name : Classrooms 1
Job Name : Barracks Renewal Quad C

Calc Time: Jul 1700h
Amb db/wb: 83.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Classrooms 1 | x 1 | 2.74 | 1,567.8 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

10-17-02
6063092204


Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

**********

CALCULATION DATA:
Zone Name : Classrooms 1
Job Name : Barracks Renewal Quad C

Calc Time: Jul 1700h
Amb db/wb: 83.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 3,711 | 0 |
| GLASS TRANSMISSION | 93 | 0 |
| WALL TRANSMISSION | 2,613 | 0 |
| ROOF TRANSMISSION | 3,212 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 4,308 W TOTAL) | 12,294 | 0 |
| OTHER ELEC. ( 2,000 W TOTAL) | 6,229 | 0 |
| PEOPLE ( 24.00 PEOPLE TOTAL) | 4,684 | 4,920 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 32,836 | 4,920 |
| NET VENTILATION LOAD ( 480 CFM) | 4,222 | 14,616 |
| SUPPLY FAN LOAD (BHP= 0.9) | 2,324 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 39,383 | 19,536 |

**********

COIL SELECTION PARAMETERS:

| | | |
|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 77.6/ 66.1 deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.1 deg F |
| COIL SENSIBLE LOAD | = | 39,383 BTU/hr |
| COIL TOTAL LOAD | = | 58,920 BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 deg F |
| TOTAL COOLING CFM (actual) | = | 1,568 CFM |
| TOTAL COOLING CFM (std. air) | = | 1,520 CFM |
| RESULTING ROOM REL. HUMIDITY | = | 48.9 % |
| COIL BYPASS FACTOR | = | 0.050 |
| COIL APPARATUS DEWPOINT | = | 52.3 deg F |
| REHEAT REQUIRED | = | 0 BTU/hr |

**********

GENERAL INFORMATION:

| | | |
|---|---|---|
| TOTAL COOLING LOAD | = | 4.91 Tons |
| | = | 365.58 sqft/Tons |
| TOTAL FLOOR AREA | = | 1,795.00 sqft |
| OVERALL U-FACTOR | = | 0.091 BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.87 CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Classrooms 1
Job Name : Barracks Renewal Quad C

Calc Time: Jul 1700h
Amb db/wb: 83.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 72 | 56 | 2,011 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 48 | 37 | 1,700 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 492 | 1,495 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 492 | 1,118 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# CLASSROOMS 2
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Classrooms 2
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Classrooms 2 |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 9 Classrooms 2 | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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**********

CALCULATION DATA:
Zone Name : Classrooms 2
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1600h
Amb db/wb: 84.5/ 73.9 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Classrooms 2 | x 1 | 11.54 | 6,611.0 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:
Zone Name : Classrooms 2
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1600h
Amb db/wb: 84.5/ 73.9 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 18,909 | 0 |
| GLASS TRANSMISSION | 406 | 0 |
| WALL TRANSMISSION | 9,334 | 0 |
| ROOF TRANSMISSION | 12,279 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 17,861 W TOTAL) | 50,246 | 0 |
| OTHER ELEC. ( 6,000 W TOTAL) | 18,558 | 0 |
| PEOPLE ( 150.00 PEOPLE TOTAL) | 28,732 | 30,750 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 138,463 | 30,750 |
| NET VENTILATION LOAD ( 3000 CFM) | 29,846 | 86,415 |
| SUPPLY FAN LOAD (BHP= 3.9) | 9,801 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 178,110 | 117,165 |

**********

COIL SELECTION PARAMETERS:

| | | |
|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 79.3/ 68.2 deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.2 deg F |
| COIL SENSIBLE LOAD | = | 178,110 BTU/hr |
| COIL TOTAL LOAD | = | 295,275 BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 deg F |
| TOTAL COOLING CFM (actual) | = | 6,611 CFM |
| TOTAL COOLING CFM (std. air) | = | 6,410 CFM |
| RESULTING ROOM REL. HUMIDITY | = | 50.8 % |
| COIL BYPASS FACTOR | = | 0.050 |
| COIL APPARATUS DEWPOINT | = | 52.2 deg F |
| REHEAT REQUIRED | = | 0 BTU/hr |

**********

GENERAL INFORMATION:

| | | |
|---|---|---|
| TOTAL COOLING LOAD | = | 24.61 Tons |
| | = | 302.44 sqft/Tons |
| TOTAL FLOOR AREA | = | 7,442.00 sqft |
| OVERALL U-FACTOR | = | 0.091 BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.89 CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Classrooms 2
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1600h
Amb db/wb: 84.5/ 73.9 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 120 | 102 | 3,021 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 360 | 305 | 15,887 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 1,992 | 5,213 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 1,992 | 4,121 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# LIVING UNIT (SINGLE)
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Single Unit 3rd Flr
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Single Unit 3rd Flr |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 12 Single Unit 3rd Flr | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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**********

CALCULATION DATA:
Zone Name : Single Unit 3rd Flr
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Single Unit 3rd Flr | x 1 | 0.49 | 278.1 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Single Unit 3rd Flr
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 2,057 | 0 |
| GLASS TRANSMISSION | 37 | 0 |
| WALL TRANSMISSION | 1,039 | 0 |
| ROOF TRANSMISSION | 310 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 427 W TOTAL) | 1,455 | 0 |
| OTHER ELEC. ( 200 W TOTAL) | 682 | 0 |
| PEOPLE ( 1.00 PEOPLE TOTAL) | 245 | 205 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 5,824 | 205 |
| NET VENTILATION LOAD ( 20 CFM) | 176 | 664 |
| SUPPLY FAN LOAD (BHP= 0.2) | 412 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 6,412 | 869 |

**********

COIL SELECTION PARAMETERS:

| | | |
|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 75.6/ 62.4 deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 deg F |
| COIL SENSIBLE LOAD | = | 6,412 BTU/hr |
| COIL TOTAL LOAD | = | 7,281 BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 deg F |
| TOTAL COOLING CFM (actual) | = | 278 CFM |
| TOTAL COOLING CFM (std. air) | = | 270 CFM |
| RESULTING ROOM REL. HUMIDITY | = | 45.8 % |
| COIL BYPASS FACTOR | = | 0.050 |
| COIL APPARATUS DEWPOINT | = | 52.4 deg F |
| REHEAT REQUIRED | = | 0 BTU/hr |

**********

GENERAL INFORMATION:

| | | |
|---|---|---|
| TOTAL COOLING LOAD | = | 0.61 Tons |
| | = | 293.36 sqft/Tons |
| TOTAL FLOOR AREA | = | 178.00 sqft |
| OVERALL U-FACTOR | = | 0.122 BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 1.56 CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Single Unit 3rd Flr
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 0 | 0 | 0 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 24 | 19 | 1,032 |
| | W | 0 | 0 | 0 |
| | NW | 24 | 19 | 1,025 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 0 | 0 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 264 | 704 | - |
| | W | 0 | 0 | - |
| | NW | 156 | 335 | - |
| | N | 0 | 0 | - |

**********

# LIVING UNIT (1+1)
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : 1+1 Unit 3rd Flr
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

10-21-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | 1+1 Unit 3rd Flr |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 13 1+1 Unit 3rd Flr | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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**********

CALCULATION DATA:
Zone Name : 1+1 Unit 3rd Flr
Job Name : Barracks Renewal Quad C

Calc Time: Jun 1700h
Amb db/wb: 82.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| 1+1 Unit 3rd Flr | x 1 | 0.47 | 271.5 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-21-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : 1+1 Unit 3rd Flr Calc Time: Jun 1700h
Job Name : Barracks Renewal Quad C Amb db/wb: 82.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 2,530 | 0 |
| GLASS TRANSMISSION | 31 | 0 |
| WALL TRANSMISSION | 774 | 0 |
| ROOF TRANSMISSION | 261 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 355 W TOTAL) | 1,210 | 0 |
| OTHER ELEC. ( 200 W TOTAL) | 682 | 0 |
| PEOPLE ( 0.81 PEOPLE TOTAL) | 198 | 166 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 5,686 | 166 |
| NET VENTILATION LOAD ( 16 CFM) | 125 | 557 |
| SUPPLY FAN LOAD (BHP= 0.2) | 402 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 6,213 | 722 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 75.4/ 62.2 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 | deg F |
| COIL SENSIBLE LOAD | = | 6,213 | BTU/hr |
| COIL TOTAL LOAD | = | 6,936 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 271 | CFM |
| TOTAL COOLING CFM (std. air) | = | 263 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 45.7 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.4 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 0.58 | Tons |
| | = | 256.06 | sqft/Tons |
| TOTAL FLOOR AREA | = | 148.00 | sqft |
| OVERALL U-FACTOR | = | 0.120 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 1.83 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-21-02
6063092204


**********

CALCULATION DATA:

Zone Name : 1+1 Unit 3rd Flr
Job Name : Barracks Renewal Quad C

Calc Time: Jun 1700h
Amb db/wb: 82.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 0 | 0 | 0 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 0 | 0 | 0 |
| | W | 0 | 0 | 0 |
| | NW | 48 | 31 | 2,530 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 0 | 0 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 0 | 0 | - |
| | W | 0 | 0 | - |
| | NW | 312 | 774 | - |
| | N | 0 | 0 | - |

**********

# LOUNGE (BLDG 357)
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Lounge
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Lounge |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 8 Lounge | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

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**********

CALCULATION DATA:
Zone Name : Lounge
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Lounge | x 1 | 6.67 | 3,820.4 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Lounge
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 12,319 | 0 |
| GLASS TRANSMISSION | 279 | 0 |
| WALL TRANSMISSION | 7,826 | 0 |
| ROOF TRANSMISSION | 7,533 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 10,394 W TOTAL) | 30,982 | 0 |
| OTHER ELEC. ( 5,000 W TOTAL) | 15,913 | 0 |
| PEOPLE ( 25.00 PEOPLE TOTAL) | 5,164 | 5,125 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 80,017 | 5,125 |
| NET VENTILATION LOAD ( 500 CFM) | 4,398 | 16,248 |
| SUPPLY FAN LOAD (BHP= 2.2) | 5,664 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 90,079 | 21,373 |

**********

COIL SELECTION PARAMETERS:

| | | |
|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 76.1/ 63.4 deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 deg F |
| COIL SENSIBLE LOAD | = | 90,079 BTU/hr |
| COIL TOTAL LOAD | = | 111,452 BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 deg F |
| TOTAL COOLING CFM (actual) | = | 3,820 CFM |
| TOTAL COOLING CFM (std. air) | = | 3,704 CFM |
| RESULTING ROOM REL. HUMIDITY | = | 46.6 % |
| COIL BYPASS FACTOR | = | 0.050 |
| COIL APPARATUS DEWPOINT | = | 52.4 deg F |
| REHEAT REQUIRED | = | 0 BTU/hr |

**********

GENERAL INFORMATION:

| | | |
|---|---|---|
| TOTAL COOLING LOAD | = | 9.29 Tons |
| | = | 466.32 sqft/Tons |
| TOTAL FLOOR AREA | = | 4,331.00 sqft |
| OVERALL U-FACTOR | = | 0.095 BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.88 CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Lounge
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1700h
Amb db/wb: 83.4/ 73.6 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 120 | 93 | 2,804 |
| | E | 0 | 0 | 0 |
| | SE | 48 | 37 | 1,257 |
| | S | 0 | 0 | 0 |
| | SW | 192 | 149 | 8,258 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 1,068 | 2,796 | - |
| | E | 0 | 0 | - |
| | SE | 720 | 2,183 | - |
| | S | 0 | 0 | - |
| | SW | 1,068 | 2,848 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# GAME ROOM
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Game Room 10-21-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE
   - Zone Name = Game Room
   - Job Name = Barracks Renewal Quad C
   - Zone Type = 1 (Normal Zone)

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

   COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

   HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

   SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

   SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

   HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

   SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

   SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

   EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

   RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

   COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 15 Game Room | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 10-21-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:
Zone Name : Game Room Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Game Room | x 1 | 1.88 | 1,074.7 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-21-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Game Room Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 3,849 | 0 |
| GLASS TRANSMISSION | 102 | 0 |
| WALL TRANSMISSION | 3,148 | 0 |
| ROOF TRANSMISSION | 1,254 | 0 |
| PARTITION TRANSMISSION | 0 | 0 |
| LIGHTING ( 1,824 W TOTAL) | 5,380 | 0 |
| OTHER ELEC. ( 2,000 W TOTAL) | 6,332 | 0 |
| PEOPLE ( 12.00 PEOPLE TOTAL) | 2,445 | 2,460 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 22,510 | 2,460 |
| NET VENTILATION LOAD ( 240 CFM) | 2,388 | 7,546 |
| SUPPLY FAN LOAD (BHP= 0.6) | 1,593 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 26,491 | 10,006 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 77.1/ 65.0 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.1 | deg F |
| COIL SENSIBLE LOAD | = | 26,491 | BTU/hr |
| COIL TOTAL LOAD | = | 36,497 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 1,075 | CFM |
| TOTAL COOLING CFM (std. air) | = | 1,042 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 47.8 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.3 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 3.04 | Tons |
| | = | 249.88 | sqft/Tons |
| TOTAL FLOOR AREA | = | 760.00 | sqft |
| OVERALL U-FACTOR | = | 0.115 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 1.41 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

10-21-02
6063092204


**********

CALCULATION DATA:

Zone Name : Game Room
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1600h
Amb db/wb: 84.5/ 73.9 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 36 | 30 | 906 |
| | E | 0 | 0 | 0 |
| | SE | 48 | 41 | 1,354 |
| | S | 0 | 0 | 0 |
| | SW | 36 | 30 | 1,589 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 420 | 1,099 | - |
| | E | 0 | 0 | - |
| | SE | 385 | 1,180 | - |
| | S | 0 | 0 | - |
| | SW | 420 | 869 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# KITCHEN
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Kitchen
Prepared By : Thermal Engineering Corporation
Carrier Hourly Analysis Program

12-17-02
6063092204


**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Kitchen |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 2 (CFM) |
| Supply air | = | 28,000 CFM |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 2 (CFM) |
| Ventilation air | = | 28,000 CFM |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 6 Kitchen | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:

Zone Name : Kitchen Calc Time: Aug 1500h
Job Name : Barracks Renewal Quad C Amb db/wb: 85.0/ 74.0 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Kitchen | x 1 | 12.10 | - |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Kitchen Calc Time: Aug 1500h
Job Name : Barracks Renewal Quad C Amb db/wb: 85.0/ 74.0 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 7,396 | 0 |
| GLASS TRANSMISSION | 186 | 0 |
| WALL TRANSMISSION | 2,483 | 0 |
| ROOF TRANSMISSION | 0 | 0 |
| PARTITION TRANSMISSION | 5,284 | 0 |
| LIGHTING ( 6,410 W TOTAL) | 17,755 | 0 |
| OTHER ELEC. ( 35,000 W TOTAL) | 107,444 | 0 |
| PEOPLE ( 25.00 PEOPLE TOTAL) | 4,692 | 5,125 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 145,240 | 5,125 |
| NET VENTILATION LOAD ( 28000 CFM) | 293,223 | 121,767 |
| SUPPLY FAN LOAD (BHP= 16.3) | 41,510 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 479,973 | 126,892 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 85.0/ 74.0 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 68.6/ 68.1 | deg F |
| COIL SENSIBLE LOAD | = | 479,973 | BTU/hr |
| COIL TOTAL LOAD | = | 606,865 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 70.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 28,000 | CFM |
| TOTAL COOLING CFM (std. air) | = | 27,150 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 78.3 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 67.8 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 50.57 | Tons |
| | = | 52.82 | sqft/Tons |
| TOTAL FLOOR AREA | = | 2,671.00 | sqft |
| OVERALL U-FACTOR | = | 0.145 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 10.48 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

12-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Kitchen
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1500h
Amb db/wb: 85.0/ 74.0 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 96 | 83 | 2,544 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 120 | 103 | 4,852 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 600 | 1,557 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 600 | 926 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# KITCHEN OFFICES
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Kitchen Offices 10-16-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE

| | | |
|---|---|---|
| Zone Name | = | Kitchen Offices |
| Job Name | = | Barracks Renewal Quad C |
| Zone Type | = | 1 (Normal Zone) |

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 5 Kitchen Offices | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 10-16-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:

Zone Name : Kitchen Offices Calc Time: Jun 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 83.5/ 73.9 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Kitchen Offices | x 1 | 1.09 | 624.0 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-16-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Kitchen Offices Calc Time: Jun 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 83.5/ 73.9 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 0 | 0 |
| GLASS TRANSMISSION | 0 | 0 |
| WALL TRANSMISSION | 1,494 | 0 |
| ROOF TRANSMISSION | 0 | 0 |
| PARTITION TRANSMISSION | 6,903 | 0 |
| LIGHTING ( 1,085 W TOTAL) | 3,052 | 0 |
| OTHER ELEC. ( 400 W TOTAL) | 1,237 | 0 |
| PEOPLE ( 2.00 PEOPLE TOTAL) | 383 | 410 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 13,069 | 410 |
| NET VENTILATION LOAD ( 40 CFM) | 356 | 1,375 |
| SUPPLY FAN LOAD (BHP= 0.4) | 925 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 14,350 | 1,785 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 75.5/ 62.3 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.0 | deg F |
| COIL SENSIBLE LOAD | = | 14,350 | BTU/hr |
| COIL TOTAL LOAD | = | 16,134 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 624 | CFM |
| TOTAL COOLING CFM (std. air) | = | 605 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 45.7 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.4 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 1.34 | Tons |
| | = | 336.17 | sqft/Tons |
| TOTAL FLOOR AREA | = | 452.00 | sqft |
| OVERALL U-FACTOR | = | 0.270 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 1.38 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 10-16-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Kitchen Offices Calc Time: Jun 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 83.5/ 73.9 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 0 | 0 | 0 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 0 | 0 | 0 |
| | W | 0 | 0 | 0 |
| | NW | 0 | 0 | 0 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 264 | 1,494 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 0 | 0 | - |
| | W | 0 | 0 | - |
| | NW | 0 | 0 | - |
| | N | 0 | 0 | - |

**********

# DISHWASHING ROOM
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Dishwashing Room 12-17-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE
   - Zone Name = Dishwashing Room
   - Job Name = Barracks Renewal Quad C
   - Zone Type = 1 (Normal Zone)

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

   COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 80.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

   HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

| | | |
|---|---|---|
| SUPPLY AIR | | |
| Type of input | = | 2 (CFM) |
| Supply air | = | 7,000 CFM |
| VENTILATION AIR | | |
| Type of input | = | 2 (CFM) |
| Ventilation air | = | 7,000 CFM |
| SAFETY FACTOR | | |
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

| | | |
|---|---|---|
| HEATING SOURCE | | |
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |
| VENTILATION AIR | | |
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |
| SAFETY FACTOR | | |
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

| | | |
|---|---|---|
| SUPPLY FAN | | |
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |
| EXHAUST AIR | | |
| Direct exhaust air flow rate | = | 0 % of vent. air |
| RETURN AIR | | |
| Is a return plenum used | = | N |
| COIL DATA | | |
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 16 Dishwashing Room | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:

Zone Name : Dishwashing Room Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Dishwashing Room | x 1 | 5.73 | - |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii — 12-17-02
Prepared By : Thermal Engineering Corp — 6063092204
Carrier Hourly Analysis Program — 

**********

CALCULATION DATA:

Zone Name : Dishwashing Room — Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C — Amb db/wb: 84.5/ 73.9 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 28,709 | 0 |
| GLASS TRANSMISSION | 189 | 0 |
| WALL TRANSMISSION | 528 | 0 |
| ROOF TRANSMISSION | 0 | 0 |
| PARTITION TRANSMISSION | 2,639 | 0 |
| LIGHTING ( 1,692 W TOTAL) | 4,760 | 0 |
| OTHER ELEC. ( 10,000 W TOTAL) | 30,930 | 0 |
| PEOPLE ( 5.00 PEOPLE TOTAL) | 958 | 1,025 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 68,712 | 1,025 |
| NET VENTILATION LOAD ( 7000 CFM) | 32,988 | 21,278 |
| SUPPLY FAN LOAD (BHP= 4.1) | 10,378 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 112,077 | 22,303 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 84.5/ 73.9 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 69.2/ 68.7 | deg F |
| COIL SENSIBLE LOAD | = | 112,077 | BTU/hr |
| COIL TOTAL LOAD | = | 134,380 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 70.6 | deg F |
| TOTAL COOLING CFM (actual) | = | 7,000 | CFM |
| TOTAL COOLING CFM (std. air) | = | 6,788 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 67.4 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 68.4 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 11.20 | Tons |
| | = | 62.96 | sqft/Tons |
| TOTAL FLOOR AREA | = | 705.00 | sqft |
| OVERALL U-FACTOR | = | 0.133 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 9.93 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Dishwashing Room Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 264 | 65 | 6,647 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 456 | 112 | 20,124 |
| | W | 0 | 0 | 0 |
| | NW | 48 | 12 | 1,938 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 0 | 0 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 0 | 0 | - |
| | W | 0 | 0 | - |
| | NW | 588 | 528 | - |
| | N | 0 | 0 | - |

**********

# DINING AREA
# PEAK COOLING LOAD

ZONE DESCRIPTION

Zone Name : Dining Area 12-17-02
Prepared By : Thermal Engineering Corporation 6063092204
Carrier Hourly Analysis Program 

**********

1. ZONE NAME AND TYPE
   - Zone Name = Dining Area
   - Job Name = Barracks Renewal Quad C
   - Zone Type = 1 (Normal Zone)

**********

2. THERMOSTAT AND EQUIPMENT SCHEDULE

   COOLING EQUIPMENT

| | | |
|---|---|---|
| Occupied cooling thermostat setpoint | = | 75.0 F |
| Unoccupied cooling thermostat setpoint | = | 85.0 F |
| Starting hour of occupied period | = | 0 |
| Number of hours in occupied period | = | 24 |

   HEATING EQUIPMENT

| | | |
|---|---|---|
| Heating thermostat setpoint | = | 70.0 F |

**********

3. COOLING SYSTEM PARAMETERS

   SUPPLY AIR

| | | |
|---|---|---|
| Type of input | = | 3 (Supply Temperature) |
| Supply temperature | = | 55.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 4 (CFM/person) |
| Ventilation air | = | 20.00 CFM/person |

   SAFETY FACTOR

| | | |
|---|---|---|
| Cooling safety factor | = | 0 % |

**********

4. HEATING SYSTEM PARAMETERS

   HEATING SOURCE

| | | |
|---|---|---|
| Type of system | = | 1 (Warm Air) |
| Supply temperature | = | 110.0 F |

   VENTILATION AIR

| | | |
|---|---|---|
| Type of input | = | 3 (% of supply) |
| Ventilation air | = | 0 % |

   SAFETY FACTOR

| | | |
|---|---|---|
| Heating safety factor | = | 0 % |

**********

5. OTHER SYSTEM PARAMETERS

   SUPPLY FAN

| | | |
|---|---|---|
| Total static pressure | = | 2.00 in wg |
| Total efficiency | = | 54 % |
| Fan configuration | = | 1 (Draw-Thru) |

   EXHAUST AIR

| | | |
|---|---|---|
| Direct exhaust air flow rate | = | 0 % of vent. air |

   RETURN AIR

| | | |
|---|---|---|
| Is a return plenum used | = | N |

   COIL DATA

| | | |
|---|---|---|
| Cooling coil bypass factor | = | 0.050 |

**********

6. SPACES INCLUDED IN ZONE

| Space Name | Qty. | Space Name | Qty. |
|---|---|---|---|
| 7 Dining Area | x 1 | | |

**********

DESIGN SPACE COOLING LOADS

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program Page 1

**********

CALCULATION DATA:

Zone Name : Dining Area Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

| Space Name | Mult | Space Sensible ( tons /space) | Supply Air (CFM/space) |
|---|---|---|---|
| Dining Area | x 1 | 12.01 | 6,880.1 |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii 12-17-02
Prepared By : Thermal Engineering Corp 6063092204
Carrier Hourly Analysis Program 

**********

CALCULATION DATA:

Zone Name : Dining Area Calc Time: Aug 1600h
Job Name : Barracks Renewal Quad C Amb db/wb: 84.5/ 73.9 F

**********

LOAD INFORMATION

| LOAD COMPONENT | SENSIBLE (BTU/hr) | LATENT (BTU/hr) |
|---|---|---|
| SOLAR LOAD | 28,709 | 0 |
| GLASS TRANSMISSION | 650 | 0 |
| WALL TRANSMISSION | 13,114 | 0 |
| ROOF TRANSMISSION | 0 | 0 |
| PARTITION TRANSMISSION | 5,285 | 0 |
| LIGHTING ( 22,896 W TOTAL) | 64,411 | 0 |
| OTHER ELEC. ( 1,829 W TOTAL) | 5,657 | 0 |
| PEOPLE ( 137.17 PEOPLE TOTAL) | 26,276 | 28,121 |
| MISCELLANEOUS LOADS | 0 | 0 |
| COOLING INFILTRATION | 0 | 0 |
| PULLDOWN/WARM-UP | 0 | 0 |
| COOLING SAFETY LOAD | 0 | 0 |
| SUB-TOTALS | 144,101 | 28,121 |
| NET VENTILATION LOAD ( 2743 CFM) | 27,294 | 80,739 |
| SUPPLY FAN LOAD (BHP= 4.0) | 10,200 | 0 |
| WALL LOAD TO PLENUM | 0 | 0 |
| ROOF LOAD TO PLENUM | 0 | 0 |
| LIGHTING LOAD TO PLENUM | 0 | 0 |
| TOTAL COOLING LOADS | 181,595 | 108,859 |

**********

COIL SELECTION PARAMETERS:

| | | | |
|---|---|---|---|
| COIL ENTERING AIR TEMP. (DB/WB) | = | 78.8/ 67.5 | deg F |
| COIL LEAVING AIR TEMP. (DB/WB) | = | 53.6/ 53.1 | deg F |
| COIL SENSIBLE LOAD | = | 181,595 | BTU/hr |
| COIL TOTAL LOAD | = | 290,454 | BTU/hr |
| COOLING SUPPLY AIR TEMPERATURE | = | 55.0 | deg F |
| TOTAL COOLING CFM (actual) | = | 6,880 | CFM |
| TOTAL COOLING CFM (std. air) | = | 6,671 | CFM |
| RESULTING ROOM REL. HUMIDITY | = | 50.1 | % |
| COIL BYPASS FACTOR | = | 0.050 | |
| COIL APPARATUS DEWPOINT | = | 52.3 | deg F |
| REHEAT REQUIRED | = | 0 | BTU/hr |

**********

GENERAL INFORMATION:

| | | | |
|---|---|---|---|
| TOTAL COOLING LOAD | = | 24.20 | Tons |
| | = | 394.14 | sqft/Tons |
| TOTAL FLOOR AREA | = | 9,540.00 | sqft |
| OVERALL U-FACTOR | = | 0.146 | BTU/hr/sqft/F |
| COOLING CFM/sqft | = | 0.72 | CFM/sqft |

**********

ZONE DESIGN COOLING LOAD SUMMARY

Location : Schofield Barracks, Hawaii
Prepared By : Thermal Engineering Corp
Carrier Hourly Analysis Program

12-17-02
6063092204


**********

CALCULATION DATA:

Zone Name : Dining Area
Job Name : Barracks Renewal Quad C

Calc Time: Aug 1600h
Amb db/wb: 84.5/ 73.9 F

**********

WALL AND GLASS LOAD BREAKDOWN

| LOAD COMPONENT | | AREA (sqft) | TRANSMISSION (BTU/hr) | SOLAR LOAD (BTU/hr) |
|---|---|---|---|---|
| GLASS LOADS: | NE | 264 | 223 | 6,647 |
| | E | 0 | 0 | 0 |
| | SE | 0 | 0 | 0 |
| | S | 0 | 0 | 0 |
| | SW | 456 | 386 | 20,124 |
| | W | 0 | 0 | 0 |
| | NW | 48 | 41 | 1,938 |
| | N | 0 | 0 | 0 |
| | H | 0 | 0 | 0 |
| WALL LOADS: | NE | 2,592 | 6,783 | - |
| | E | 0 | 0 | - |
| | SE | 0 | 0 | - |
| | S | 0 | 0 | - |
| | SW | 2,592 | 5,362 | - |
| | W | 0 | 0 | - |
| | NW | 588 | 969 | - |
| | N | 0 | 0 | - |

**********

# VAC EQUIPMENT SELECTION

# CHILLER

# Product Data

# 30HXA076-271
# 30HXC076-271
# Condenserless and Fluid-Cooled Chillers
# 50/60 Hz

75 to 265 Tons (264 to 931 kW)

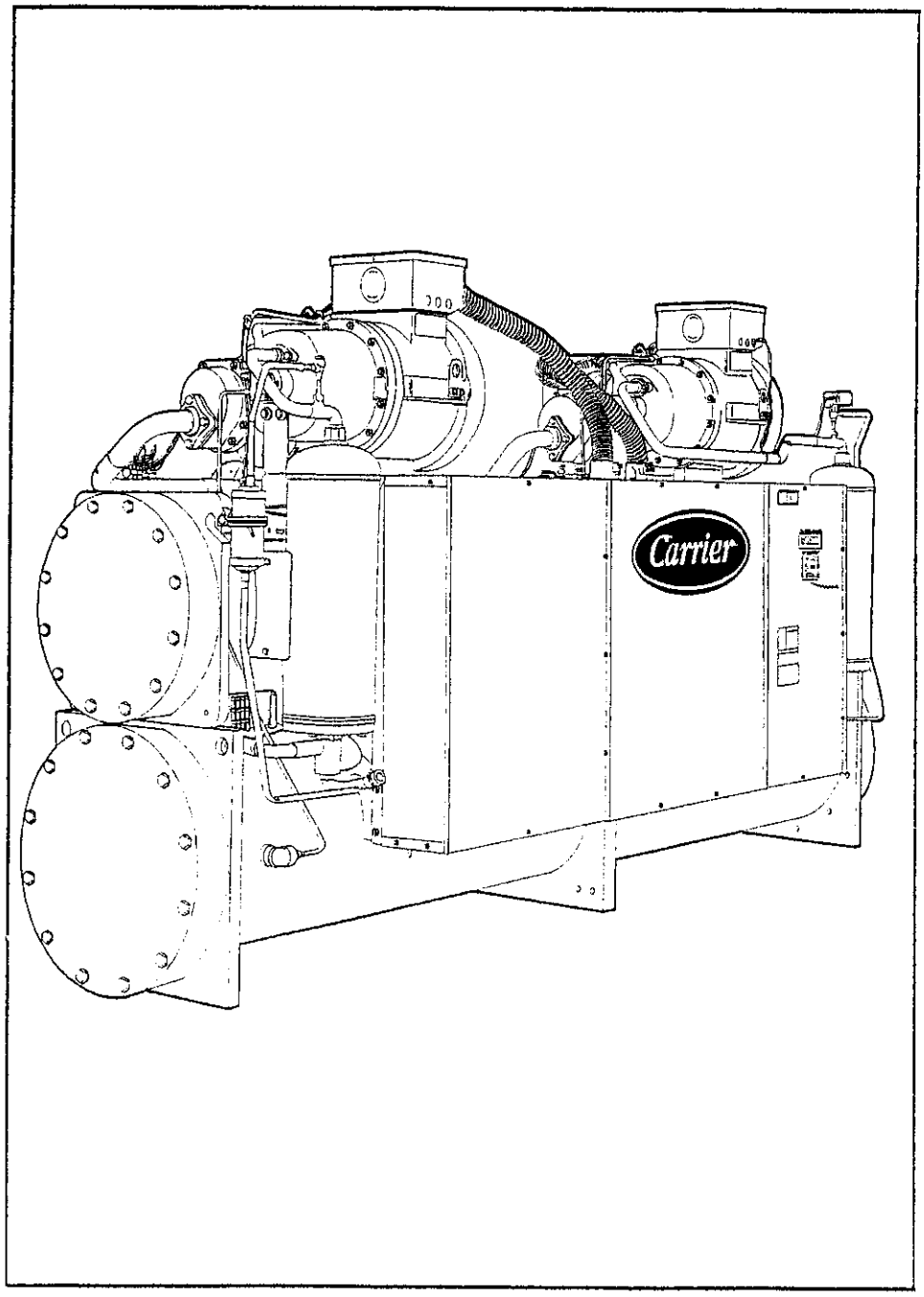
***Quality Assurance***

Carrier Corporation UL REGISTERED FIRM ISO 9002 #A2280

BSI REGISTERED FIRM

Certificate No FM 21837

**Approvals:**
ISO 9002
EN 29002
BS5750 PART 2
ANSI/ASQC Q92




Fluid-cooled and condenserless chillers designed from the ground up to meet the needs of today and tomorrow, including:

- Fits through a standard door with no disassembly required
- Chlorine-free HFC-134a refrigerant
- Dual circuit independent refrigerant
- Smooth compression using twin screw compressors
- ARI certified efficiencies to .53 kW/ton

# Features/Benefits

## Quality design and construction make the 30HXC (Fluid Cooled) and the 30HXA (Condenserless) units the preferred choice

### Easy installation

The 30HX chiller has a compact design that fits through a standard door opening and requires minimal indoor space. The 30HX chiller is delivered as a complete package for easy installation. There are no extra controls, clocks, starters, or other items to install.

The 30HX unit also provides a single location electrical power entrance (using the accessory field-installed control transformer) and quick, easy piping using either welded or accessory victaulic-type clamp-on couplings for the cooler.

The 30HX 208/230-v, 230-v, 460-v and 575-v units are designed in accordance with UL (Underwriters' Laboratory, U.S.A.) and CSA (Canadian Standards Association) standards to minimize electrical inspection time.

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A quick start-up is assured once installation is complete, since each 30HX unit is manufactured at an ISO 9002-listed manufacturing facility to guarantee quality. In addition, all 30HXC units are tested under load at the factory to provide reliable start-up.

## Easy operation

The 30HX units have a quiet, low-vibration design featuring screw compressors.

Efficiency levels of the 30HX units exceed minimums established by ASHRAE (American Society of Heating and Refrigeration Engineers) and CSA for both full- and part-load operation, thus saving on operating costs through lower electrical costs. All 30HX units are also rated in accordance with ARI (Air Conditioning and Refrigeration Institute, U.S.A.) standards. The 60 Hz 30HXC units are ARI certified.

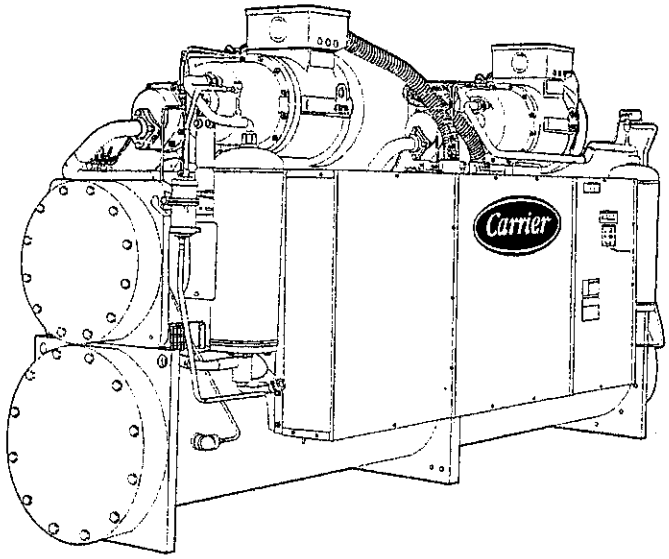
The 30HX controls are fully automatic. The leaving-fluid temperature is directly controlled, and the entering-fluid temperature is continuously monitored to detect load and flow changes controlling to within .5° F (.3° C).

Dual, independent refrigerant circuits provide reliable, dependable cooling, and the 30HX units use medium-pressure HFC-134a refrigerant to minimize stress on the compressors and ensure a long life.

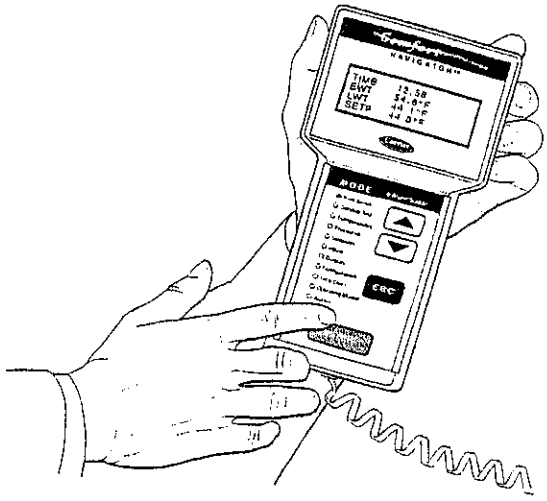
From a service standpoint, the 30HX units offer the following features:

- Use of HFC-134a refrigerant, which has no planned phase-out in its future
- Mechanically-cleanable cooler and condenser (30HXC units)
- Twin-screw compressors, which require no routine service or maintenance
- Easily accessed service information includes suction and discharge pressure and temperature using standard Navigator™ display module

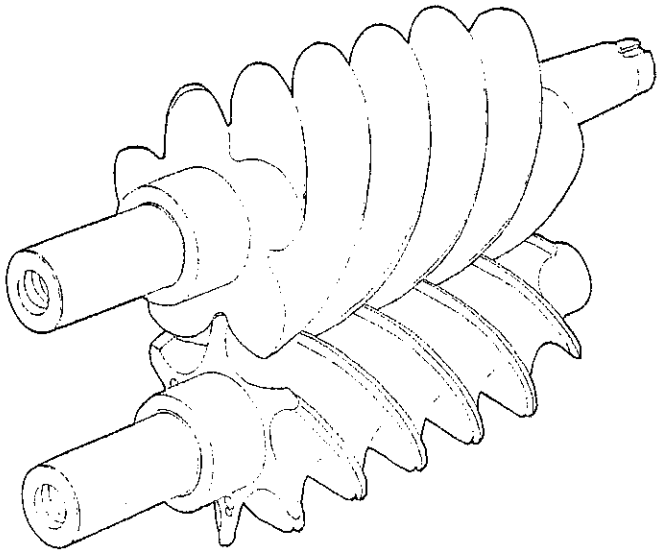
DUAL INDEPENDENT REFRIGERANT CIRCUITS



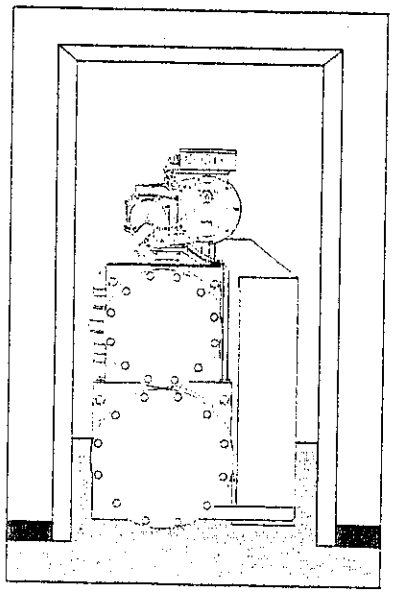

NAVIGATOR IN DISPLAY MODE




TWIN-SCREW COMPRESSOR DESIGN



FITS THROUGH STANDARD DOORWAY



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# Model number nomenclature

30HX C 106 --- 6 - 1 --

**30HX** — Indoor Liquid Chiller

**Condenser Type**
A — Condenserless
C — Fluid Cooled

**Nominal Unit Size — Tons (kW)**

| | |
|---|---|
| 076 — 75 (264) | 161 — 155 (545) |
| 086 — 85 (300) | 171 — 165 (580) |
| 096 — 95 (335) | 186 — 175 (615) |
| 106 — 105 (370) | 206 — 211 (743) ← |
| 116 — 115 (405) | 246 — 246 (866) |
| 126 — 125 (440) | 261 — 255 (896) |
| 136 — 135 (475) | 271 — 265 (931) |
| 146 — 145 (510) | |

**FIOPS**
Contact your Carrier representative

**FIOPS**
Contact your Carrier representative.

**Packaging**
1 — Domestic
3 — Export

Not Used

**Electrical Characteristics**
1 — 575-3-60
2 — 380-3-60
4 — 230-3-60
5 — 208/230-3-60
6 — 460-3-60
8 — 230-3-50
9 — 380/415-3-50

LEGEND

FIOPS — Factory-Installed Options

## ENGLISH (cont)

| UNIT SIZE 30HX | 161 | 171 | 186 | 206 | 246 | 261 | 271 |
|---|---|---|---|---|---|---|---|
| UNIT WEIGHT (lb) | | | | | | | |
| Fluid Cooled (HXC) | 7452 | 7660 | 7854 | 10,581 | 10,969 | 10,992 | 11,029 |
| Condenserless (HXA) | 5752 | 5777 | 5946 | 7,485 | 7,621 | 7,621 | 7,621 |
| COMPRESSORS | Semi-Hermetic, Twin Screw | | | | | | |
| Quantity | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| Nominal Capacity per Compressor (tons) | 80/56 | 66/80 | 80/80 | 66/39/80 | 80/56/80 | 80/66/80 | 80/80/80 |
| Economizer | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| No. Capacity Steps | | | | | | | |
| Standard | 6 | 6 | 6 | 8 | 8 | 8 | 8 |
| Optional (maximum) | 8 | 8 | 8 | 11 | 11 | 11 | 11 |
| Minimum Step Capacity (%) | | | | | | | |
| Standard | 20 | 20 | 20 | 13 | 13 | 13 | 13 |
| Optional | 10 | 10 | 10 | 7 | 7 | 7 | 7 |
| REFRIGERANT | R-134a | | | | | | |
| Charge* (lb) Circuit A/Circuit B | 150/110 | 119/140 | 135/135 | 220/135 | 220/135 | 220/135 | 220/135 |
| COOLER TYPE | Shell and Tube with Enhanced Copper Tubes | | | | | | |
| Part No. 10HX400- | 104 | 012 | 013 | 125 | 126 | 126 | 126 |
| Net Fluid Volume (gal) | 28.5 | 28.5 | 33.4 | 43.1 | 47.2 | 47.2 | 47.2 |
| Maximum Refrigerant Pressure (psig) | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Maximum Fluid-Side Pressure (psig) | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Fluid Connections | | | | | | | |
| Inlet and Outlet (in.) | 5 | 5 | 5 | 6 | 6 | 6 | 6 |
| Drain (NPT) | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 3/4 |
| Relief Valve | | | | | | | |
| Connection (in. NPTF) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Flow Capacity (lb air/min) | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 |
| Relief Setting (psig) | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Standard Number of Passes | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 30HXA OIL SEPARATOR | | | | | | | |
| Part No. 09RX400- | 167 | 168 | 168 | 106 | 106 | 106 | 106 |
| Maximum Refrigerant Pressure (psig) | 320 | 320 | 320 | 320 | 320 | 320 | 320 |
| Refrigerant Connections (in.) | | | | | | | |
| Discharge Circuit A/B | 2 1/8/2 1/8 | 2 1/8/2 1/8 | 2 1/8/2 1/8 | 2 1/8/2 1/8 | 2 1/8/2 1/8 | 2 1/8/2 1/8 | 2 1/8/2 1/8 |
| Liquid Circuit A/B | 1 3/8/1 3/8 | 1 3/8/1 3/8 | 1 3/8/1 3/8 | 1 5/8/1 3/8 | 1 5/8/1 3/8 | 1 5/8/1 3/8 | 1 5/8/1 3/8 |
| Relief Valve | | | | | | | |
| Connection (in. SAE Flare) | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 | 5/8 |
| Flow Capacity (lb air/min) | 21.6 | 21.6 | 21.6 | 21.6 | 21.6 | 21.6 | 21.6 |
| Relief Setting (psig) | 320 | 320 | 320 | 320 | 320 | 320 | 320 |
| CONDENSER (HXC) | Shell and Tube with Enhanced Copper Tubes | | | | | | |
| Part No. 09RX400- | 178 | 178 | 178 | 179 | 180 | 180 | 180 |
| Net Fluid Volume (gal) | 30.6 | 37.6 | 37.6 | 47.6 | 55.1 | 55.1 | 55.1 |
| Maximum Refrigerant Pressure (psig) | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Maximum Water-Side Pressure (psig) | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| Water Connections (in.) | | | | | | | |
| Inlet and Outlet | 5 | 5 | 5 | 6 | 6 | 6 | 6 |
| Drain (NPT) | 1/2 | 1/2 | 1/2 | 3/4 | 3/4 | 3/4 | 3/4 |
| Relief Valve | | | | | | | |
| Connection (in. NPTF) | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 | 3/4 |
| Flow Capacity (lb air/min) | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 | 31.7 |
| Relief Setting (psig) | 220 | 220 | 220 | 220 | 220 | 220 | 220 |
| Standard Number of Passes | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| DISCHARGE LINE† | | | | | | | |
| Relief Valve | | | | | | | |
| Connection (in. SAE Flare) | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 | 3/8 |
| Flow Capacity (lb air/min) | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 | 6.3 |
| Setting (psig) | 350 | 350 | 350 | 350 | 350 | 350 | 350 |

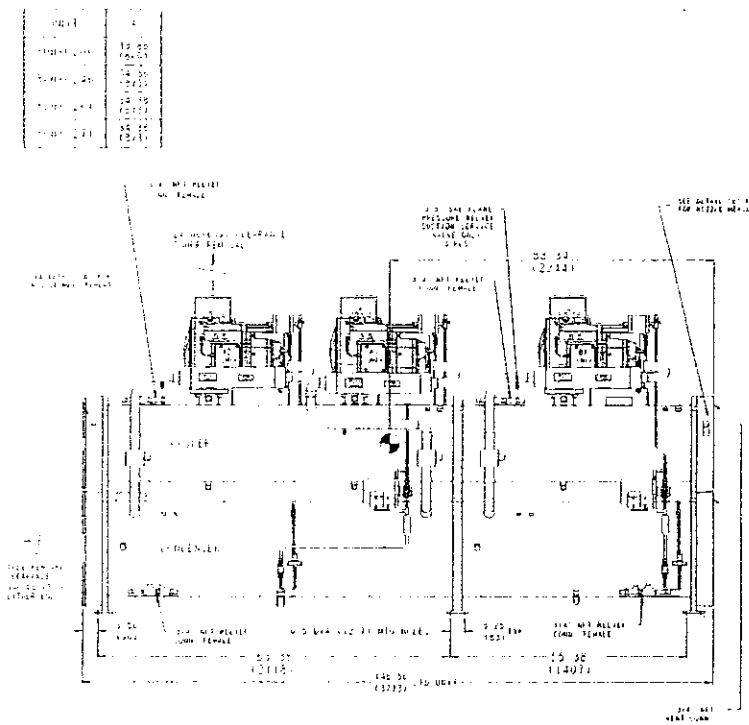
LEGEND

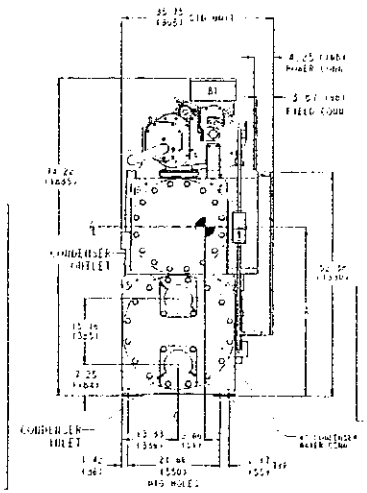
NPTF — National Pipe Thread Female
SAE — Society of Automotive Engineers

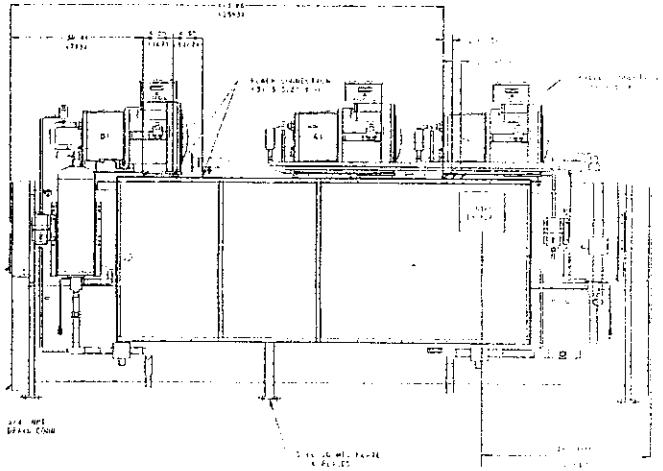
* Charges listed are for 30HXC units. The 30HXA units are shipped with a holding charge only. To determine the refrigerant charge requirements for 30HXA units see the System Refrigerant Charge table in the Application Data on page 26.
† Only on units with factory-installed suction service valves.

## 30HXC206-271

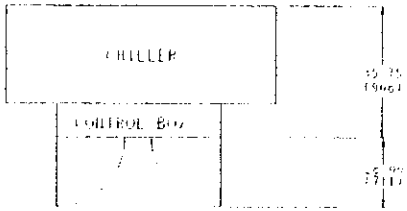
NOTES:
1. OPERATING WEIGHT INCLUDES WEIGHT OF WATER AND REFRIGERANT.
2. ◐ DENOTES CENTER OF GRAVITY.
3. — DENOTES ACCESSORY OR FACTORY INSTALLED OPTION.
4. DIMENSIONS ARE IN INCHES (MM) AND WEIGHTS ARE IN LB (KG).
5. 36 IN. (914.4) RECOMMENDED SERVICE CLEARANCE AROUND MACHINE.

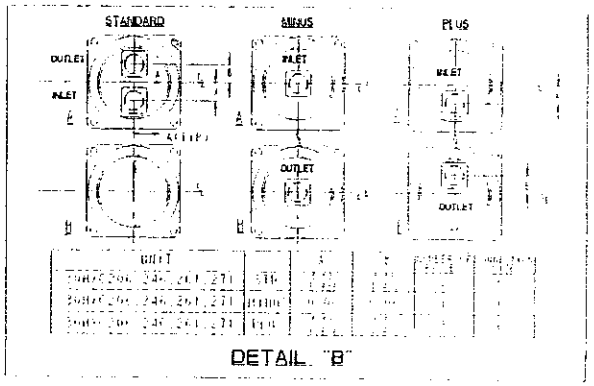






DOOR SWING CLEARANCE



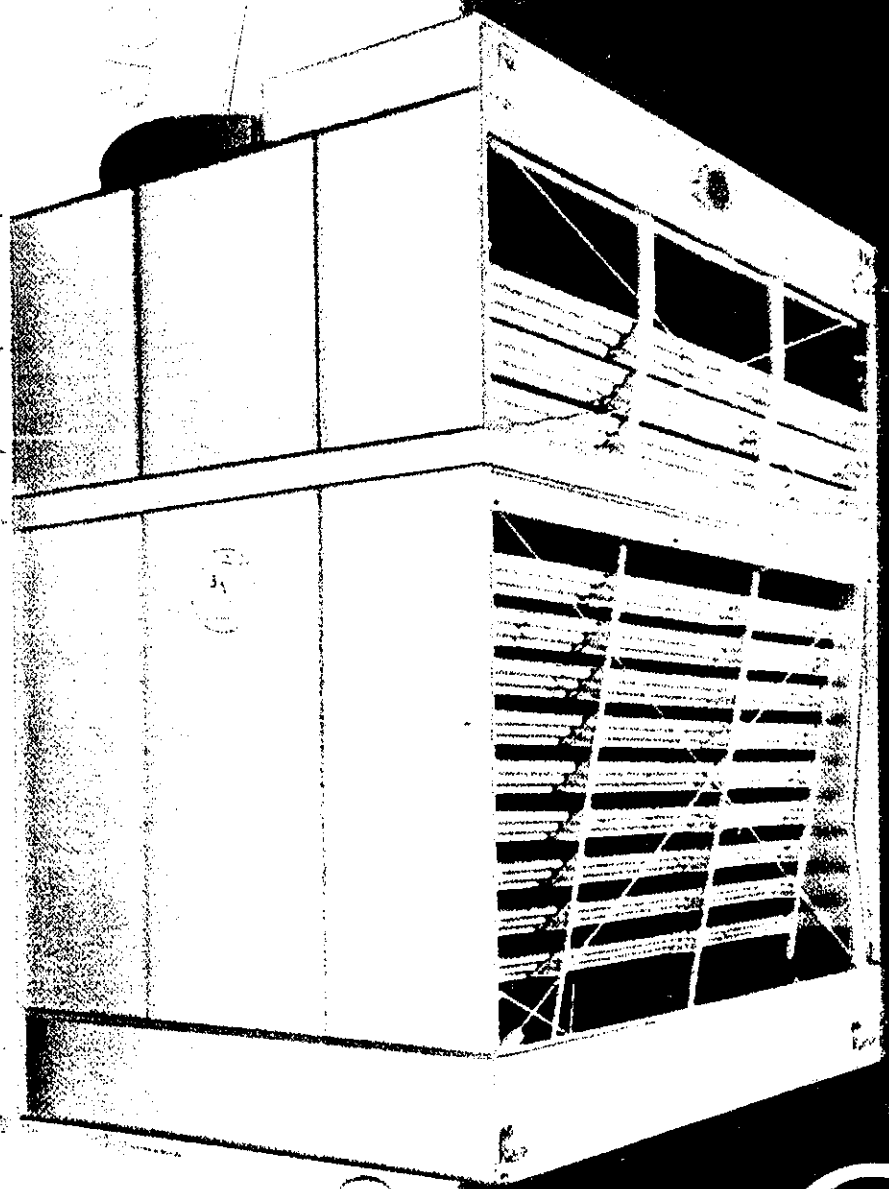



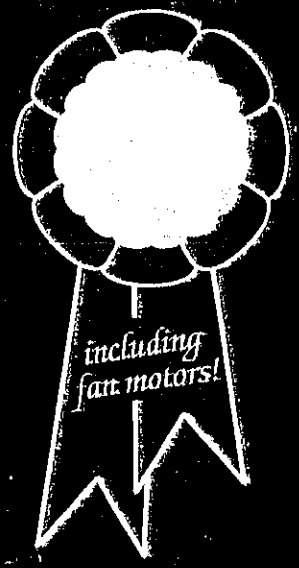

DETAIL "B"

# COOLING TOWER

# SERIES 1500
# COOLING TOWERS

Engineering Bulletin





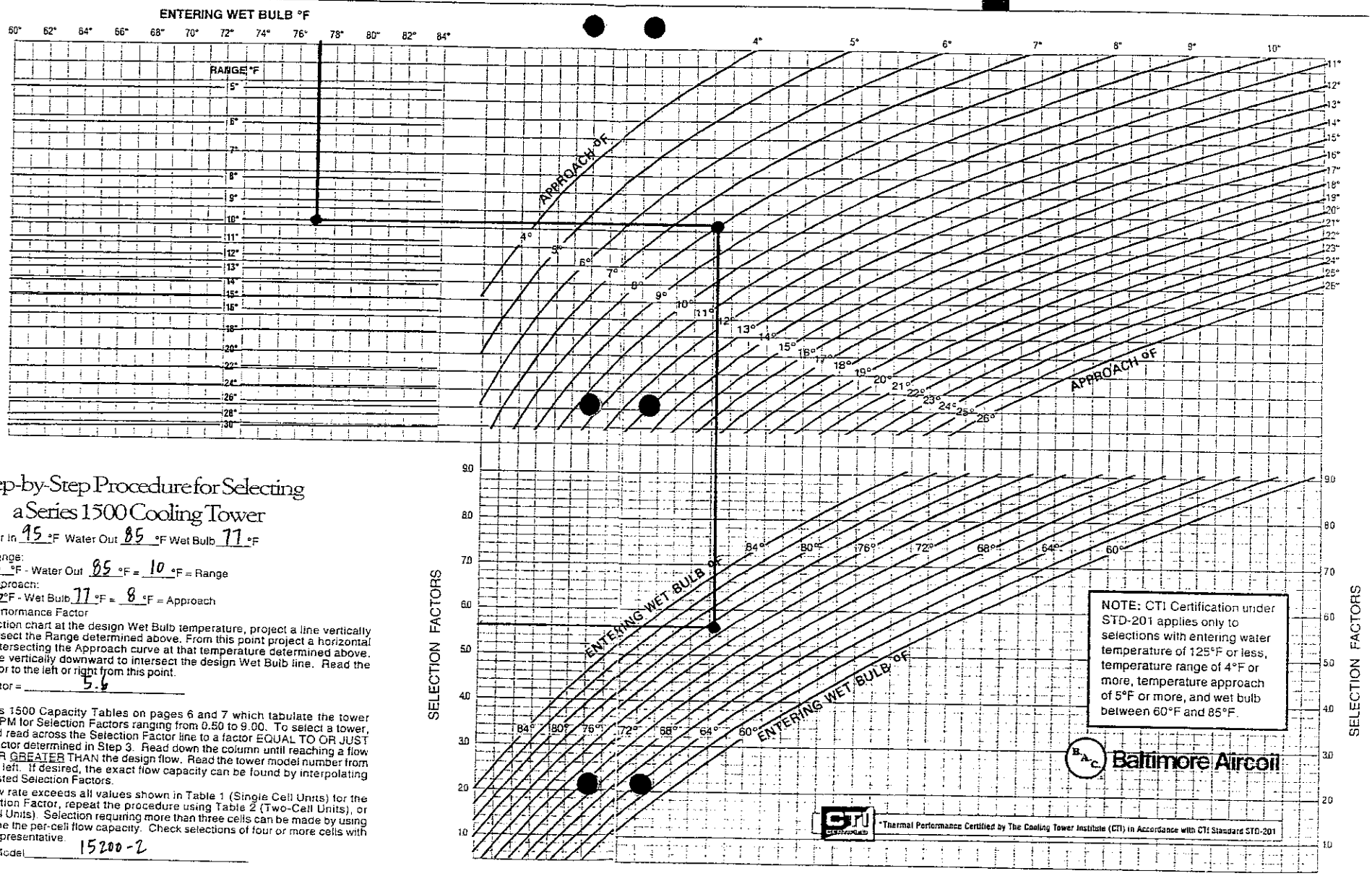

Baltimore Aircoil

MINIMIZE THE TOTAL COST OF OWNERSHIP

# SERIES 1500 SELECTION CHART








## Step-by-Step Procedure for Selecting a Series 1500 Cooling Tower

GPM 1200 Water In 95 °F Water Out 85 °F Wet Bulb 77 °F

1. Determine Range:
   Water In 95 °F - Water Out 85 °F = 10 °F = Range
2. Determine Approach:
   Water Out 85 °F - Wet Bulb 77 °F = 8 °F = Approach
3. Determine Performance Factor

Entering the selection chart at the design Wet Bulb temperature, project a line vertically downward to intersect the Range determined above. From this point project a horizontal line to the right intersecting the Approach curve at that temperature determined above. Then project a line vertically downward to intersect the design Wet Bulb line. Read the Performance Factor to the left or right from this point.

Selection Factor = 5.6

4. Select Unit

Turn to the Series 1500 Capacity Tables on pages 6 and 7 which tabulate the tower capacities in USGPM for Selection Factors ranging from 0.50 to 9.00. To select a tower, enter the table and read across the Selection Factor line to a factor EQUAL TO OR JUST LESS THAN the factor determined in Step 3. Read down the column until reaching a flow rate EQUAL TO OR GREATER THAN the design flow. Read the tower model number from the column on the left. If desired, the exact flow capacity can be found by interpolating directly between listed Selection Factors.

If the required flow rate exceeds all values shown in Table 1 (Single Cell Units) for the appropriate Selection Factor, repeat the procedure using Table 2 (Two-Cell Units), or Table 3 (Three-Cell Units). Selection requiring more than three cells can be made by using Table 1 to determine the per-cell flow capacity. Check selections of four or more cells with the local B.A.C. Representative.

Final Selection Is Model 15200-2

# SERIES 1500 CAPACITY TABLES

## TABLE 1 - Single Cell Units

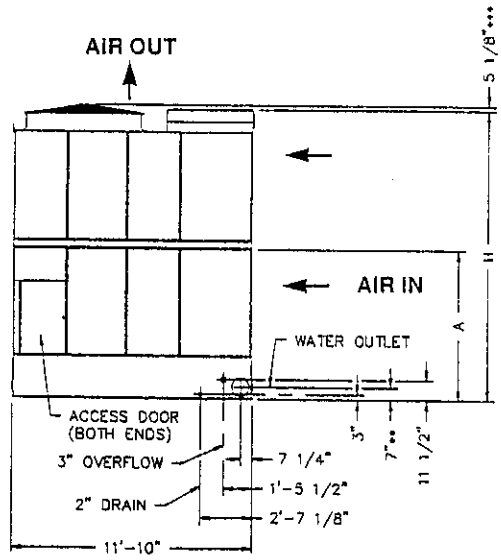
| Model No. | SELECTION FACTOR | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 |
| 15146 | 242 | 258 | 276 | 295 | 315 | 336 | 359 | 384 | 410 | 438 | 468 | 500 | 534 | 571 | 610 | 651 | 695 | 743 |
| 15160 | 265 | 283 | 303 | 323 | 345 | 369 | 394 | 421 | 449 | 480 | 513 | 548 | 585 | 625 | 667 | 713 | 761 | 813 |
| 15176 | 292 | 312 | 333 | 356 | 380 | 406 | 433 | 463 | 494 | 528 | 564 | 602 | 643 | 687 | 734 | 784 | 837 | 894 |
| 15162 | 276 | 294 | 313 | 333 | 355 | 378 | 402 | 428 | 456 | 486 | 518 | 551 | 587 | 625 | 666 | 709 | 756 | 805 |
| 15177 | 302 | 321 | 342 | 364 | 388 | 416 | 440 | 468 | 499 | 531 | 565 | 602 | 641 | 683 | 727 | 774 | 824 | 878 |
| 15201 | 343 | 365 | 389 | 414 | 441 | 469 | 500 | 532 | 566 | 603 | 642 | 684 | 728 | 775 | 825 | 878 | 935 | 996 |
| 15219 | 374 | 398 | 424 | 452 | 481 | 512 | 545 | 580 | 617 | 657 | 699 | 745 | 793 | 844 | 898 | 956 | 1018 | 1083 |
| 15200 | 355 | 376 | 399 | 423 | 448 | 475 | 504 | 534 | 566 | 600 | 636 | 674 | 715 | 758 | 804 | 852 | 903 | 958 |
| 15227 | 404 | 428 | 454 | 481 | 510 | 540 | 572 | 606 | 643 | 681 | 722 | 765 | 810 | 859 | 910 | 965 | 1022 | 1083 |
| 15250 | 446 | 473 | 501 | 531 | 562 | 595 | 631 | 668 | 708 | 750 | 795 | 842 | 892 | 945 | 1001 | 1060 | 1123 | 1190 |
| 15214 | 376 | 399 | 424 | 450 | 477 | 506 | 537 | 570 | 605 | 642 | 681 | 723 | 767 | 814 | 864 | 917 | 973 | 1032 |
| 15245 | 433 | 459 | 487 | 516 | 548 | 581 | 616 | 653 | 693 | 735 | 780 | 827 | 877 | 930 | 986 | 1046 | 1046 | 1177 |
| 15270 | 479 | 508 | 538 | 570 | 605 | 641 | 680 | 721 | 764 | 810 | 859 | 910 | 965 | 1023 | 1085 | 1150 | 1150 | 1293 |
| 15282 | 501 | 531 | 563 | 596 | 632 | 670 | 710 | 753 | 798 | 846 | 897 | 951 | 1008 | 1068 | 1132 | 1200 | 1200 | 1349 |
| 15296 | 523 | 555 | 589 | 624 | 662 | 702 | 745 | 790 | 837 | 888 | 942 | 999 | 1059 | 1123 | 1191 | 1263 | 1340 | 1421 |
| 15325 | 576 | 610 | 647 | 686 | 728 | 772 | 818 | 867 | 920 | 975 | 1034 | 1096 | 1162 | 1232 | 1306 | 1385 | 1469 | 1557 |
| 15350 | 621 | 659 | 698 | 740 | 785 | 832 | 882 | 934 | 991 | 1050 | 1113 | 1180 | 1251 | 1326 | 1405 | 1490 | 1579 | 1674 |
| 15368 | 654 | 694 | 735 | 779 | 826 | 875 | 927 | 983 | 1042 | 1104 | 1170 | 1240 | 1314 | 1393 | 1476 | 1565 | 1658 | 1757 |
| 15310 | 543 | 577 | 612 | 650 | 690 | 732 | 777 | 825 | 876 | 930 | 987 | 1048 | 1113 | 1181 | 1254 | 1331 | 1413 | 1500 |
| 15340 | 597 | 634 | 673 | 714 | 758 | 804 | 853 | 906 | 961 | 1020 | 1083 | 1149 | 1219 | 1294 | 1373 | 1458 | 1547 | 1642 |
| 15365 | 642 | 682 | 723 | 767 | 814 | 864 | 917 | 973 | 1032 | 1095 | 1162 | 1233 | 1308 | 1388 | 1473 | 1563 | 1658 | 1759 |
| 15385 | 679 | 720 | 764 | 811 | 860 | 912 | 968 | 1026 | 1089 | 1155 | 1225 | 1300 | 1379 | 1463 | 1552 | 1646 | 1746 | 1852 |
| 15425 | 751 | 797 | 845 | 896 | 950 | 1008 | 1069 | 1134 | 1202 | 1275 | 1352 | 1434 | 1521 | 1613 | 1711 | 1814 | 1924 | 2041 |

## TABLE 2 - Two Cell Units

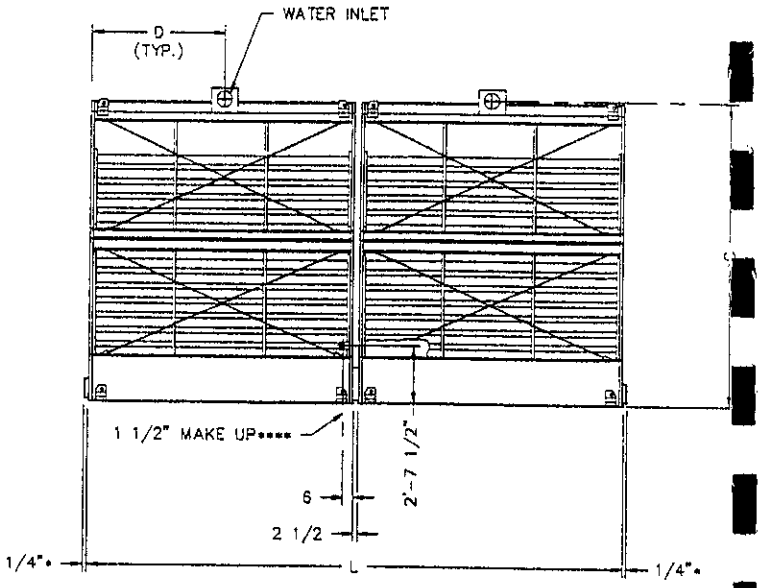
| Model No. | SELECTION FACTOR | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.5 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | 5.0 | 5.5 | 6.0 | 6.5 | 7.0 | 7.5 | 8.0 | 8.5 | 9.0 |
| 15146-2 | 484 | 516 | 552 | 590 | 630 | 672 | 718 | 768 | 820 | 876 | 936 | 1000 | 1068 | 1142 | 1220 | 1302 | 1392 | 1486 |
| 15160-2 | 530 | 566 | 606 | 646 | 690 | 738 | 788 | 842 | 898 | 960 | 1032 | 1096 | 1170 | 1250 | 1334 | 1426 | 1522 | 1626 |
| 15176-2 | 584 | 624 | 666 | 712 | 760 | 812 | 866 | 926 | 988 | 1058 | 1128 | 1204 | 1286 | 1374 | 1468 | 1568 | 1674 | 1788 |
| 15162-2 | 552 | 588 | 626 | 666 | 710 | 756 | 804 | 856 | 912 | 972 | 1036 | 1102 | 1174 | 1250 | 1332 | 1418 | 1512 | 1610 |
| 15177-2 | 604 | 642 | 684 | 728 | 776 | 832 | 880 | 936 | 998 | 1062 | 1130 | 1204 | 1282 | 1366 | 1454 | 1548 | 1648 | 1756 |
| 15201-2 | 686 | 730 | 778 | 828 | 882 | 938 | 1000 | 1064 | 1132 | 1206 | 1284 | 1368 | 1456 | 1550 | 1650 | 1756 | 1870 | 1992 |
| 15219-2 | 748 | 796 | 848 | 904 | 962 | 1024 | 1090 | 1160 | 1234 | 1314 | 1398 | 1490 | 1586 | 1688 | 1796 | 1912 | 2036 | 2166 |
| 15200-2 | 710 | 752 | 798 | 846 | 896 | 950 | 1008 | 1068 | 1132 | 1200 | 1272 | 1348 | 1430 | 1516 | 1608 | 1704 | 1806 | 1916 |
| 15227-2 | 808 | 856 | 908 | 962 | 1020 | 1080 | 1144 | 1212 | 1286 | 1362 | 1444 | 1530 | 1620 | 1718 | 1820 | 1930 | 2044 | 2166 |
| 15250-2 | 892 | 946 | 1002 | 1062 | 1124 | 1190 | 1262 | 1336 | 1416 | 1500 | 1590 | 1684 | 1784 | 1890 | 2002 | 2120 | 2246 | 2380 |
| 15214-2 | 752 | 798 | 848 | 900 | 954 | 1012 | 1074 | 1140 | 1210 | 1284 | 1362 | 1446 | 1534 | 1628 | 1728 | 1834 | 1946 | 2064 |
| 15245-2 | 866 | 918 | 974 | 1032 | 1096 | 1162 | 1232 | 1306 | 1386 | 1470 | 1560 | 1654 | 1754 | 1860 | 1972 | 2092 | 2218 | 2354 |
| 15270-2 | 958 | 1016 | 1076 | 1140 | 1210 | 1282 | 1360 | 1442 | 1528 | 1620 | 1718 | 1820 | 1930 | 2046 | 2170 | 2300 | 2438 | 2586 |
| 15282-2 | 1002 | 1062 | 1126 | 1192 | 1264 | 1340 | 1420 | 1506 | 1596 | 1692 | 1794 | 1902 | 2016 | 2136 | 2264 | 2400 | 2544 | 2698 |
| 15296-2 | 1046 | 1110 | 1178 | 1248 | 1324 | 1404 | 1490 | 1580 | 1674 | 1776 | 1882 | 1998 | 2118 | 2246 | 2382 | 2526 | 2680 | 2842 |
| 15325-2 | 1152 | 1220 | 1294 | 1372 | 1456 | 1544 | 1636 | 1734 | 1840 | 1950 | 2068 | 2192 | 2324 | 2464 | 2612 | 2770 | 2938 | 3114 |
| 15350-2 | 1242 | 1318 | 1396 | 1480 | 1570 | 1664 | 1764 | 1868 | 1982 | 2100 | 2226 | 2360 | 2502 | 2652 | 2810 | 2980 | 3158 | 3348 |
| 15368-2 | 1308 | 1388 | 1470 | 1558 | 1652 | 1750 | 1854 | 1966 | 2084 | 2208 | 2340 | 2480 | 2628 | 2786 | 2952 | 3130 | 3316 | 3514 |
| 15310-2 | 1086 | 1154 | 224 | 1300 | 1380 | 1464 | 1554 | 1650 | 1752 | 1860 | 1974 | 2096 | 2226 | 2362 | 2508 | 2662 | 2826 | 3000 |
| 15340-2 | 1194 | 1268 | 1346 | 1428 | 1516 | 1608 | 1706 | 1812 | 1922 | 2040 | 2166 | 2298 | 2438 | 2588 | 2746 | 2916 | 3094 | 3284 |
| 15365-2 | 1284 | 1364 | 1446 | 1534 | 1628 | 1728 | 1834 | 1946 | 2064 | 2190 | 2324 | 2466 | 2616 | 2776 | 2946 | 3126 | 3316 | 3518 |
| 15385-2 | 1358 | 1440 | 1528 | 1622 | 1720 | 1824 | 1936 | 2052 | 2178 | 2310 | 2450 | 2600 | 2758 | 2926 | 3104 | 3292 | 3492 | 3704 |
| 15425-2 | 1502 | 1594 | 1690 | 1792 | 1900 | 2016 | 2138 | 2268 | 2404 | 2550 | 2704 | 2868 | 3042 | 3226 | 3422 | 3628 | 3848 | 4082 |

# Engineering Data- Two Cell Units

Do not use for construction. Refer to factory certified dimensions. This brochure includes data current at the time of publication which should be reconfirmed at the time of purchase.




CONNECTIONS SAME BOTH ENDS




* 15296-2 through 15425-2 - 2 1/8"
** 15296-2 through 15425-2 - 8"
*** 15146-2 through 15219-2 and 15296-2 through 15425-2- 2 3/4"
**** 15296-2 through 15425-2 - 2"

| Model No. | NOMF Tons[1] | STD Motor HP | Dual Motor Option | CFM | Weights (LBS.) Shipping | Nominal Oper. | Max Oper. | Heaviest Section[3] | Dimensions L | H | A | B | C | D | Conn. Sizes IN[2] | OUT[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 15146-2 | 292 | (2) 7.5 | N/A | 80,640 | 7,880 | 14,900 | 15,840 | 3,940 | 17'-2" | 10'-3" | N/A | 9'-9" | 4'-3" | | (2) 6" | (2) 8" |
| 15160-2 | 320 | (2) 10 | N/A | 88,380 | 7,920 | 15,080 | 15,880 | 3,960 | 17'-2" | 10'-3" | N/A | 9'-9" | 4'-3" | | (2) 6" | (2) 8" |
| 15176-2 | 352 | (2) 15 | N/A | 96,320 | 8,020 | 15,280 | 15,980 | 4,010 | 17'-2" | 10'-3" | N/A | 9'-9" | 4'-3" | | (2) 6" | (2) 8" |
| 15162-2 | 324 | (2) 7.5 | N/A | 86,160 | 8,400 | 15,980 | 17,220 | 4,200 | 17'-2" | 11'-7" | N/A | 11'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15177-2 | 354 | (2) 10 | N/A | 94,140 | 8,440 | 16,200 | 17,260 | 4,220 | 17'-2" | 11'-7" | N/A | 11'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15201-2 | 402 | (2) 15 | N/A | 106,900 | 8,560 | 16,580 | 17,380 | 4,280 | 17'-2" | 11'-7" | N/A | 11'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15219-2 | 438 | (2) 20 | N/A | 116,480 | 8,600 | 16,720 | 17,420 | 4,300 | 17'-2" | 11'-7" | N/A | 11'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15200-2 | 400 | (2) 10 | N/A | 104,640 | 10,700 | 19,680 | 22,860 | 2,770 | 17'-2" | 14'-3" | 7'-5" | 13'-9" | 4'-3" | | (2) 6" | (2)8" |
| 15227-2 | 454 | (2) 15 | N/A | 118,760 | 10,820 | 20,200 | 22,980 | 2,780 | 17'-2" | 14'-3" | 7'-5" | 13'-9" | 4'-3" | | (2) 6" | (2)8" |
| 15250-2 | 500 | (2) 20 | N/A | 130,800 | 10,860 | 20,560 | 23,020 | 2,800 | 17'-2" | 14'-3" | 7'-5" | 13'-9" | 4'-3" | | (2) 6" | (2)8" |
| 15214-2 | 428 | (2) 10 | N/A | 113,220 | 11,280 | 20,880 | 24,900 | 2,920 | 17'-2" | 15'-7" | 8'-9" | 15'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15245-2 | 490 | (2) 15 | N/A | 129,620 | 11,400 | 21,460 | 25,020 | 2,920 | 17'-2" | 15'-7" | 8'-9" | 15'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15270-2 | 540 | (2) 20 | N/A | 142,840 | 11,440 | 21,880 | 25,060 | 2,920 | 17'-2" | 15'-7" | 8'-9" | 15'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15282-2 | 564 | (2) 25 | N/A | 149,200 | 11,600 | 22,240 | 25,220 | 2,920 | 17'-2" | 15'-7" | 8'-9" | 15'-1" | 4'-3" | | (2) 6" | (2) 8" |
| 15296-2 | 592 | (2) 15 | (4) 7.5 | 154,880 | 13,500 | 25,840 | 31,080 | 3,540 | 24'-5" | 14'-3" | 7'-5" | 13'-9" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15325-2 | 650 | (2) 20 | (4) 10 | 170,060 | 13,600 | 26,320 | 31,180 | 3,590 | 24'-5" | 14'-3" | 7'-5" | 13'-9" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15350-2 | 700 | (2) 25 | (4) 15 | 183,120 | 13,700 | 26,760 | 31,280 | 3,640 | 24'-5" | 14'-3" | 7'-5" | 13'-9" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15368-2 | 736 | (2) 30 | (4) 15 | 192,560 | 13,740 | 27,100 | 31,320 | 3,660 | 24'-5" | 14'-3" | 7'-5" | 13'-9" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15310-2 | 620 | (2) 15 | (4) 7.5 | 164,000 | 14,140 | 27,280 | 34,100 | 3,540 | 24'-5" | 15'-7" | 8'-9" | 15'-1" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15340-2 | 680 | (2) 20 | (4) 10 | 179,880 | 14,240 | 27,840 | 34,200 | 3,590 | 24'-5" | 15'-7" | 8'-9" | 15'-1" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15365-2 | 730 | (2) 25 | (4) 15 | 193,100 | 14,340 | 28,340 | 34,300 | 3,640 | 24'-5" | 15'-7" | 8'-9" | 15'-1" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15385-2 | 770 | (2) 30 | (4) 15 | 203,680 | 14,400 | 28,720 | 34,360 | 3,670 | 24'-5" | 15'-7" | 8'-9" | 15'-1" | 6'-5/8" | | (2) 8" | (2) 8" |
| 15425-2 | 850 | (2) 40 | (4) 20 | 224,860 | 14,940 | 29,800 | 34,900 | 3,940 | 24'-5" | 15'-7" | 8'-9" | 15'-1" | 6'-5/8" | | (2) 8" | (2) 8" |

## Notes

1. Nominal tons are defined as 3 gpm of water per ton, cooled from 95° F to 85° F with a 78° F entering wet bulb. Unless otherwise indicated, all connections 3" and smaller are MPT. Connections 4" and larger are beveled for welding and mechanically grooved.
2. The actual size of the inlet and outlet connections will vary with the design flow rate. Consult unit print for certified dimensions.
3. The heaviest section for all models except 15214-2 through 15282-2 is the upper section.

# AIR HANDLING UNITS

| AREA SERVED | SIZE | WIDTH | HEIGHT | LENGTH |
|---|---|---|---|---|
| KITCHEN | 50 | 120" | 74" | 68" FAN<br>31" FILTER<br>31" COIL<br>48" PLENUM<br>+ 48" PLENUM<br>226" TOTAL |
| BILLETING MODULES | 21 | 76" | 49" | 49" FAN<br>25" FILTER<br>16" COIL<br>34" PLENUM<br>+ 34" PLENUM<br>158" TOTAL |
| DINING AREA, CLASSROOMS 2 | 25 | 78" | 55" | 55" FAN<br>25" FILTER<br>16" COIL<br>40" PLENUM<br>+ 40" PLENUM<br>176" TOTAL |
| DISHWASHING ROOM, BATTALION HEADQUARTERS | 12 | 64" | 38" | 38" FAN<br>25" FILTER<br>16" COIL<br>34" PLENUM<br>+ 34" PLENUM<br>147" TOTAL |

THERMAL ENGINEERING CORPORATION

SUBJECT

AIR HANDLING UNITS
(CENTRAL STATION)

DATE 12/17/02
BY RKS
SHEET 1 OF 2
JOB NO 02030 C01

| AREA SERVED | SIZE | WIDTH | HEIGHT | LENGTH |
|---|---|---|---|---|
| MEDIUM COMPANY OPS | 8 | 43" | 31" | 44" FAN<br>31" FILTER<br>16" COIL<br>31" PLENUM<br>31" PLENUM<br>153" TOTAL |
| LARGE COMPANY OPS | 10 | 60" | 34" | 34" FAN<br>25" FILTER<br>16" COIL<br>34" PLENUM<br>34" PLENUM<br>143" TOTAL |
| CLASSROOMS 1 | 6 | 44" | 28" | 41" FAN<br>28" FILTER<br>16" COIL<br>28" PLENUM<br>28" PLENUM<br>141" TOTAL |
| LOUNGE (BLDG 357) | 10 | 60" | 34" | 34" FAN<br>25" FILTER<br>16" COIL<br>34" PLENUM<br>34" PLENUM<br>143" TOTAL |

THERMAL ENGINEERING CORPORATION

SUBJECT

AIR HANDLING UNITS
(CENTRAL STATION)

DATE 12/17/02
BY RKS
SHEET 2 OF 2
JOB NO D2030C01

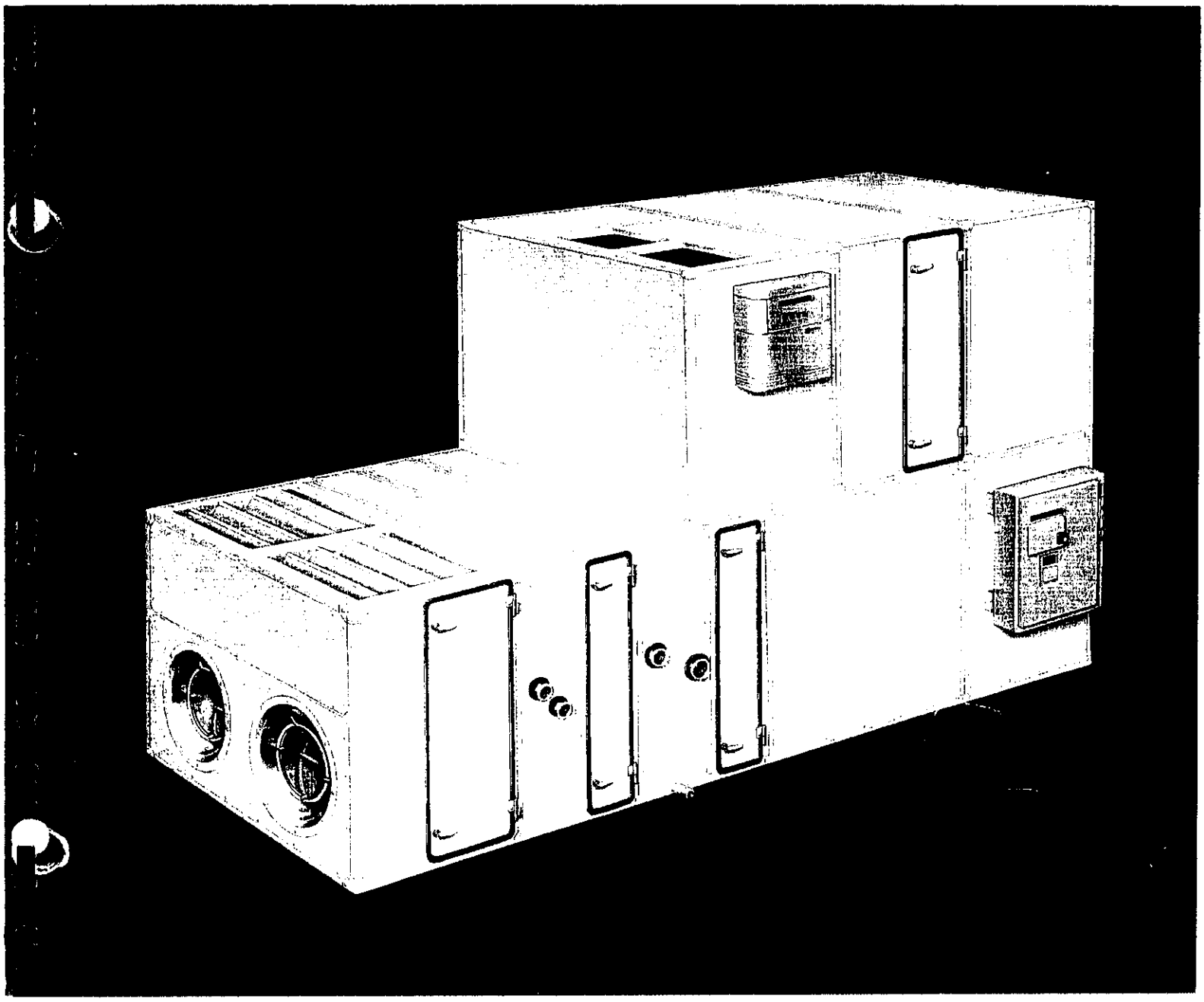
TRANE

CLCH-DS-7
March 1997
Second Printing

# Modular Climate Changer®
# Air Handlers

## Sizes 3 through 100

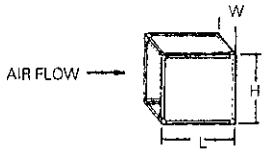
CLCH-DS-7



CLASSROOMS 1

# Unit Sizes

Size 06




| | Module | H = 27 1/4<br>W = 44<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 15 1/2 | 124 | 124 |
| B | Traq Damper Mixing Box | 27 1/4 | 194 | 232 |
| C | Mixing/Filter-Mixing Box | 27 1/4 | 194 | 232 |
| D | Economizer | 27 1/4 | 194 | 232 |
| E | Air Blender | 42 3/4 | 201 | 262 |
| F | Open Return Filter | 4 | 13 | 13 |
| G | Flat Filter | 11 | 80 | 96 |
| H | Angled Filter | 27 1/4 | 135 | 174 |
| I | Bag Filter | 41 | 164 | 223 |
| J | Cartridge Filter | 27 1/4 | 164 | 175 |
| K | Small Inspection or Blank | 11 | 67 | 83 |
| L | Medium Access or Blank | 15 1/2 | 77 | 99 |
| N | Large Access or Blank | 27 1/4 | 112 | 151 |
| O | Extra Large Access or Blank | 41 | 140 | 199 |
| P | Turning or Vertical Blank | 27 1/4 | 112 | 256 |
| Q | Small Horizontal Coil | 11 | 68 | 84 |
| R | Medium Horizontal Coil | 15 1/2 | 81 | 103 |
| T | Large Horizontal Coil | 27 1/4 | 114 | 153 |
| U | Vertical Coil | 27 1/4 | 112 | 256 |
| W | Moisture Eliminator | 11 | 91 | 107 |
| X | External Face and Bypass | 15 1/2<br>H = 32 1/4 | 136 | 158 |
| Y | Internal Face and Bypass | 26 1/2 | 115 | 137 |
| Z | Face Damper | 15 1/2 | 121 | 143 |
| AA | Horizontal Fan | 41<br>FC Fan | 373 | 446 |
| AB | Diffuser | 15 1/2 | 87 | 109 |
| AC | Top-Mounted Discharge Plenum | 41<br>H = 27 1/4 | N/A | 209 |
| AD | Front-Mounted Discharge Plenum | 27 1/4 | N/A | 163 |
| AE | Multizone/Double Duct | 46 1/2<br>H = 4 1/2 | 362 | 435 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-8 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| **1/2" Unit Coils** UW, UF | 5.86 | 1-23x36 |
| **Shipping Coils** Full | 4.38 | 1-18x35 |
| Custom | 5.13 | 1-18x41 |
| Modified | 2.92 | 1-12x35 |
| Hot Deck | 2.90 | 1-12x35 |

**Table U-9 — Coil Availability**

| Module Size | 1/2" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row | 1-4 Row |
| Large | N/A | 1-10 Row |
| Vertical | 2-8 Row | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-10 — 1/2" Unit Coil Water Connection Sizes (Inches)**

| | UW |
|---|---|
| Header Height | 23 |
| Supply | 1 1/2 |
| Return | 1 1/2 |
| Drain & Vent | 3/8 |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-11 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 5.6 | 2-20x20 |
| Angled (TA, permanent, pleated media) | 8.9 | 4-16x20 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 5.6 | 2-20x20 |

Refer to page 78 for filter pressure drops.

**Table U-12 — Areas**

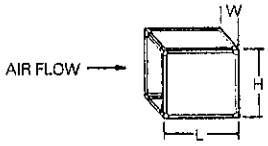
| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 1.84 |
| Airfoil Blade Damper | 3.07 |
| Internal Face and Bypass | |
| Face Area | 1.44 |
| Bypass Area | 1.44 |
| External Face and Bypass | |
| Face Area | 4.33 |
| Bypass Area | 2.88 |
| Face Damper | 4.33 |
| Multizone (per deck) | 2.64 |
| (Max. zones/deck) | 6 |
| Air Blender | 2.28 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

MEDIUM COMPANY UP

# Unit Sizes

Size 08




| | | H = 31 | Weights | |
|---|---|---|---|---|
| | | W = 48 | Single | Double |
| | Module | L | Wall | Wall |
| A | Intake Module | 15 ½ | 141 | 142 |
| B | Traq Damper Mixing Box | 31 | 237 | 286 |
| C | Mixing/Filter-Mixing Box | 31 | 237 | 286 |
| D | Economizer | 31 | 237 | 286 |
| E | Air Blender | 46 ½ | 233 | 307 |
| F | Open Return Filter | 4 | 14 | 14 |
| G | Flat Filter | 11 | 87 | 105 |
| H | Angled Filter | 31 | 158 | 207 |
| I | Bag Filter | 44 | 188 | 258 |
| J | Cartridge Filter | 31 | 188 | 210 |
| K | Small Inspection or Blank | 11 | 73 | 91 |
| L | Medium Access or Blank | 15 ½ | 85 | 110 |
| N | Large Access or Blank | 31 | 134 | 183 |
| O | Extra Large Access or Blank | 44 | 161 | 231 |
| P | Turning or Vertical Blank | 31 | 134 | 298 |
| Q | Small Horizontal Coil | 11 | 74 | 92 |
| R | Medium Horizontal Coil | 15 ½ | 88 | 113 |
| T | Large Horizontal Coil | 31 | 136 | 185 |
| U | Vertical Coil | 31 | 134 | 298 |
| W | Moisture Eliminator | 11 | 105 | 123 |
| X | External Face and Bypass | 15 ½ | 163 | 188 |
| | | H = 36 | | |
| Y | Internal Face and Bypass | 15 ½ | 129 | 154 |
| Z | Face Damper | 15 ½ | 147 | 172 |
| AA | Horizontal Fan | 44 | - | |
| | | FC Fan | 447 | 542 |
| AB | Diffuser | 15 ½ | 96 | 121 |
| AC | Top-Mounted Discharge Plenum | 44 | N/A | 236 |
| | | H = 31 | | |
| AD | Front-Mounted Discharge Plenum | 31 | N/A | 198 |
| AE | Multizone/Double Duct | 46 ½ | 392 | 474 |
| | | H = 48 | | |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-14 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| ½" Unit Coils UW, UF | 7.54 | 1-27x40 |
| Shipping Coils Full | 6.50 | 1-24x39 |
| Custom | 7.50 | 1-24x45 |
| Modified | 4.88 | 1-18x39 |
| Hot Deck | 3.30 | 1-12x39 |

**Table U-15 — Coil Availability**

| Module Size | ½" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row | 1-4 Row |
| Large | N/A | 1-10 Row |
| Vertical | 2-8 Row | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-16 — ½" Unit Coil Water Connection Sizes (Inches)**

| | UW |
|---|---|
| Header Height | 27 |
| Supply | 1 ½ |
| Return | 1 ½ |
| Drain & Vent | ⅜ |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-17 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 6.9 | 2-20x25 |
| Angled (TA, permanent, pleated media) | 11.1 | 4-20x20 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 6.7 | 2-20x24 |

Refer to page 78 for filter pressure drops.

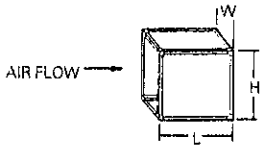
**Table U-18 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 1.84 |
| Airfoil Blade Damper | 3.46 |
| Internal Face and Bypass | |
| Face Area | 3.19 |
| Bypass Area | 1.59 |
| External Face and Bypass | |
| Face Area | 6.38 |
| Bypass Area | 3.19 |
| Face Damper | 6.38 |
| Multizone (per deck) | 3.07 |
| (Max. zones/deck) | 7 |
| Air Blender | 2.76 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

LARGE COMPANY OPS,
Size 10 LOUNGE (BLDG 357)

# Unit Sizes




| | Module | H = 34<br>W = 60<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 15 1/2 | 187 | 210 |
| B | Traq Damper Mixing Box | 34 | 325 | 389 |
| C | Mixing/Filter-Mixing Box | 34 | 325 | 389 |
| D | Economizer | 34 | 325 | 389 |
| E | Air Blender | 49 1/2 | 299 | 393 |
| F | Open Return Filter | 4 | 25 | 25 |
| G | Flat Filter | 11 | 113 | 134 |
| H | Angled Filter | 24 1/2 | 161 | 198 |
| I | Bag Filter | 34 | 216 | 280 |
| J | Cartridge Filter | 24 1/2 | 173 | 210 |
| K | Small Inspection or Blank | 11 | 87 | 108 |
| L | Medium Access or Blank | 15 1/2 | 104 | 134 |
| M | Medium Large Access or Blank | 24 1/2 | 129 | 166 |
| N | Large Access or Blank | 34 | 172 | 236 |
| O | Extra Large Access or Blank | 34 | 172 | 236 |
| P | Turning or Vertical Blank | 34 | 172 | 411 |
| Q | Small Horizontal Coil | 11 | 94 | 115 |
| R | Medium Horizontal Coil | 15 1/2 | 112 | 142 |
| S | Medium Large Horizontal | 24 1/2 | 125 | 188 |
| T | Large Horizontal Coil | 34 | 194 | 258 |
| U | Vertical Coil | 34 | 172 | 411 |
| V | Coil w/Access | 24 1/2 | 540 | 603 |
| W | Moisture Eliminator | 11 | 163 | 184 |
| X | External Face and Bypass | 15 1/2<br>H = 39 | 211 | 241 |
| Y | Internal Face and Bypass | 15 1/2 | 184 | 214 |
| Z | Face Damper | 15 1/2 | 183 | 213 |
| AA | Horizontal Fan | 34<br>FC Fan | 514 | 589 |
| | | BI Fan | 669 | 744 |
| AB | Diffuser | 15 1/2 | 111 | 141 |
| AC | Top-Mounted Discharge Plenum | 34<br>H = 34 | N/A | 274 |
| AD | Front-Mounted Discharge Plenum | 34 | N/A | 274 |
| AE | Multizone/Double Duct | 46 1/2<br>H = 53 | 485 | 583 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-20 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| **1/2" Unit Coils** UW, UF | 9.64 | 1-27x51 |
| **Shipping Coils** Full | 8.33 | 1-24x50 |
| Custom | 9.50 | 1-24x57 |
| Modified | 6.25 | 1-18x50 |
| Hot Deck | 6.30 | 1-18x50 |

**Table U-21 — Coil Availability**

| Module Size | 1/2" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row | 1-4 Row |
| Medium Large | | |
| Coil | N/A | 1-8 Row |
| Coil w/Access | 2-8 Row | 1-4 Row |
| Vertical | 2-8 Row | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-22 — 1/2" Unit Coil Water Connection Sizes (Inches)**

| | UW |
|---|---|
| Header Height | 27 |
| Supply | 1 1/2 |
| Return | 1 1/2 |
| Drain & Vent | 3/8 |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-23 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 9.7 | 2-20x25<br>1-16x25 |
| Angled (TA, permanent, pleated media) | 13.9 | 4-20x25 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 9.3 | 3-12x24<br>1-20x24 |

Refer to page 78 for filter pressure drops.

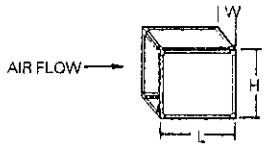
**Table U-24 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 2.77 |
| Airfoil Blade Damper | 7.71 |
| Internal Face and Bypass | |
| Face Area | 6.16 |
| Bypass Area | 2.05 |
| External Face and Bypass | |
| Face Area | 8.21 |
| Bypass Area | 4.11 |
| Face Damper | 8.21 |
| Multizone (per deck) | 4.98 |
| (Max. zones/deck) | 9 |
| Air Blender | 3.86 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

# Unit Sizes

Size 12 DISHWASHING ROOM, BATTALION HEADQUARTERS




| | Module | H = 38<br>W = 64<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 15 ½ | 208 | 235 |
| B | Traq Damper Mixing Box | 34 | 349 | 419 |
| C | Mixing/Filter-Mixing Box | 34 | 349 | 419 |
| D | Economizer | 34 | 349 | 419 |
| E | Air Blender | 49 ½ | 322 | 424 |
| F | Open Return Filter | 4 | 25 | 25 |
| G | Flat Filter | 11 | 120 | 143 |
| H | Angled Filter | 24 ½ | 172 | 211 |
| I | Bag Filter | 38 | 244 | 322 |
| J | Cartridge Filter | 24 ½ | 183 | 222 |
| K | Small Inspection or Blank | 11 | 93 | 116 |
| L | Medium Access or Blank | 15 ½ | 112 | 144 |
| M | Medium Large Access or Blank | 24 ½ | 138 | 177 |
| N | Large Access or Blank | 34 | 184 | 254 |
| O | Extra Large Access or Blank | 38 | 199 | 277 |
| P | Turning or Vertical Blank | 34 | 184 | 441 |
| Q | Small Horizontal Coil | 11 | 100 | 123 |
| R | Medium Horizontal Coil | 15 ½ | 119 | 151 |
| S | Medium Large Horizontal | 24 ½ | 125 | 201 |
| T | Large Horizontal Coil | 34 | 208 | 278 |
| U | Vertical Coil | 34 | 184 | 441 |
| V | Coil w/Access | 24 ½ | 670 | 748 |
| W | Moisture Eliminator | 11 | 184 | 207 |
| X | External Face and Bypass | 15 ½<br>H = 43 | 243 | 275 |
| Y | Internal Face and Bypass | 15 ½ | 200 | 232 |
| Z | Face Damper | 15 ½ | 215 | 247 |
| AA | Horizontal Fan | 38 | | |
| | | FC Fan | 595 | 684 |
| | | BI Fan | 845 | 918 |
| | | Q-Fan | | |
| | | Q | 642 | 731 |
| | | R | 766 | 855 |
| AB | Diffuser | 15 ½ | 122 | 154 |
| AC | Top-Mounted Discharge Plenum | 38<br>H = 34 | N/A | 301 |
| AD | Front-Mounted Discharge Plenum | 34 | N/A | 301 |
| AE | Multizone/Double Duct | 65<br>H = 57 | 634 | 781 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-26 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| **½" Unit Coils** UW, UU, UF | 12.30 | 1-32x55 |
| 6 Row UU | 11.70 | 1-30x54 |
| **Shipping Coils** Full | 11.30 | 1-30x54 |
| Custom | 12.70 | 1-30x61 |
| Modified | 9.00 | 1-24x54 |
| Hot Deck | 6.80 | 1-18x54 |

**Table U-27 — Coil Availability**

| Module Size | ½" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row *except 6 Row UU | 1-4 Row |
| Medium Large | | |
| Coil | 6 Row UU | 1-8 Row |
| Coil w/Access | 2-8 Row* | 1-4 Row |
| Vertical | 2-8 Row* | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row* | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-28 — ½" Unit Coil Water Connection Sizes (Inches)**

| | UW/UU | 6 Row UU |
|---|---|---|
| Header Height | 32 | 30 |
| Supply | 2 | 2 ½ |
| Return | 2 | 2 ½ |
| Drain & Vent | ⅜ | ⅜ |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-29 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 13.3 | 6-16x20 |
| Angled (TA, permanent, pleated media) | 16.7 | 6-20x20 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 10.0 | 3-20x24 |

Refer to page 78 for filter pressure drops.

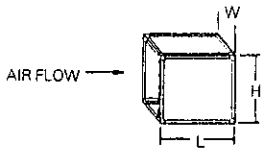
**Table U-30 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 4.19 |
| Airfoil Blade Damper | 8.26 |
| Internal Face and Bypass | |
| Face Area | 6.62 |
| Bypass Area | 2.21 |
| External Face and Bypass | |
| Face Area | 11.03 |
| Bypass Area | 4.41 |
| Face Damper | 11.03 |
| Multizone (per deck) | 4.98 |
| (Max. zones/deck) | 9 |
| Air Blender | 5.14 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

# Unit Sizes

BILLETING MODULES




| | Module | H = 48 1/2<br>W = 76<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 15 1/2 | 273 | 309 |
| B | Traq Damper Mixing Box | 48 1/2 | 625 | 732 |
| C | Mixing/Filter-Mixing Box | 34 | 494 | 579 |
| D | Economizer | 34 | 494 | 579 |
| E | Air Blender | 49 1/2 | 397 | 521 |
| F | Open Return Filter | 4 | 32 | 32 |
| G | Flat Filter | 11 | 145 | 173 |
| H | Angled Filter | 24 1/2 | 238 | 285 |
| I | Bag Filter | 48 1/2 | 346 | 467 |
| J | Cartridge Filter | 24 1/2 | 223 | 270 |
| K | Small Inspection or Blank | 11 | 111 | 139 |
| L | Medium Access or Blank | 15 1/2 | 134 | 173 |
| M | Medium Large Access or Blank | 24 1/2 | 161 | 208 |
| N | Large Access or Blank | 34 | 220 | 305 |
| O | Extra Large Access or Blank | 48 1/2 | 284 | 405 |
| P | Turning or Vertical Blank | 34 | 220 | 527 |
| Q | Small Horizontal Coil | 11 | 118 | 146 |
| R | Medium Horizontal Coil | 15 1/2 | 141 | 180 |
| S | Medium Large Horizontal | 24 1/2 | 134 | 235 |
| T | Large Horizontal Coil | 34 | 247 | 332 |
| U | Vertical Coil | 34 | 220 | 527 |
| V | Coil w/Access | 24 1/2 | 944 | 1045 |
| W | Moisture Eliminator | 11 | 247 | 275 |
| X | External Face and Bypass | 15 1/2<br>H = 53 1/2 | 332 | 371 |
| Y | Internal Face and Bypass | 15 1/2 | 274 | 313 |
| Z | Face Damper | 15 1/2 | 305 | 344 |
| AA | Horizontal Fan | 48 1/2 | | |
| | | FC Fan | 905 | 1021 |
| | | BI Fan | 1356 | 1385 |
| | | Plug Fan | 1137 | 1396 |
| | | Q-Fan | | |
| | | Q | 996 | 1112 |
| | | R | 1066 | 1182 |
| AB | Diffuser | 15 1/2 | 2156 | 196 |
| AC | Top-Mounted Discharge Plenum | 48 1/2<br>H = 34 | N/A | 379 |
| AD | Front-Mounted Discharge Plenum | 34 | N/A | 379 |
| AE | Multizone/Double Duct | 65<br>H = 71 1/2 | 750 | 930 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-44 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 1/2" Unit Coils UW,UU,UF | 20.80 | 1-45x67 |
| 6 Row UU | 17.20 | 2-18x66 |
| **Shipping Coils** Full | 16.50 | 2-18x66 |
| Custom | 18.30 | 2-18x73 |
| Custom Extra Full W | 21.30 | 1-42x73 |
| Modified | 15.10 | 1-33x66 |
| Hot Deck | 11.00 | 1-24x66 |

**Table U-45 — Coil Availability**

| Module Size | 1/2" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row *except 6 Row UU | 1-4 Row |
| Medium Large Coil | 6 Row UU | 1-8 Row |
| Coil w/Access | 2-8 Row* | 1-4 Row |
| Vertical | 2-8 Row* | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row* | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-46 — 1/2" Unit Coil Water Connection Sizes (Inches)**

| | UW/UU | 6 Row UU |
|---|---|---|
| Header Height | 45 | 2-18 |
| Supply | 2 1/2 | 2 1/2 |
| Return | 2 1/2 | 2 1/2 |
| Drain & Vent | 3/8 | 3/8 |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-47 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 20.0 | 4-20x20<br>4-16x20 |
| Angled (TA, permanent, pleated media) | 31.1 | 4-16x20<br>8-16x25 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 22.0 | 3-20x24<br>3-24x24 |

Refer to page 78 for filter pressure drops.

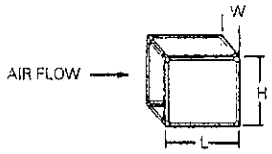
**Table U-48 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 6.28 |
| Airfoil Blade Damper | 12.79 |
| Internal Face and Bypass | |
| Face Area | 12.56 |
| Bypass Area | 2.51 |
| External Face and Bypass | |
| Face Area | 18.65 |
| Bypass Area | 5.02 |
| Face Damper | 18.65 |
| Multizone (per deck) | 7.35 |
| (Max. zones/deck) | 11 |
| Air Blender | 7.72 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

# Unit Sizes

Size 25 DINING AREA, CLASSROOMS 2




| | Module | H = 54 3/4<br>W = 78<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 15 1/2 | 301 | 342 |
| B | Traq Damper Mixing Box | 40 | 567 | 674 |
| C | Mixing/Filter-Mixing Box | 40 | 567 | 674 |
| D | Economizer | 40 | 567 | 674 |
| E | Air Blender | 55 1/2 | 458 | 607 |
| F | Open Return Filter | 4 | 33 | 33 |
| G | Flat Filter | 11 | 152 | 182 |
| H | Angled Filter | 24 1/2 | 250 | 300 |
| I | Bag Filter | 54 3/4 | 395 | 540 |
| J | Cartridge Filter | 24 1/2 | 237 | 287 |
| K | Small Inspection or Blank | 11 | 118 | 148 |
| L | Medium Access or Blank | 15 1/2 | 146 | 188 |
| M | Medium Large Access or Blank | 24 1/2 | 174 | 224 |
| N | Large Access or Blank | 40 | 264 | 371 |
| O | Extra Large Access or Blank | 54 3/4 | 332 | 477 |
| P | Turning or Vertical Blank | 40 | 264 | 609 |
| Q | Small Horizontal Coil | 11 | 125 | 155 |
| R | Medium Horizontal Coil | 15 1/2 | 148 | 190 |
| S | Medium Large Horizontal | 24 1/2 | 136 | 252 |
| T | Large Horizontal Coil | 40 | 292 | 399 |
| U | Vertical Coil | 40 | 264 | 609 |
| V | Coil w/Access | 24 1/2 | 1087 | 1203 |
| W | Moisture Eliminator | 11 | 272 | 302 |
| X | External Face and Bypass | 15 1/2<br>H = 59 3/4 | 370 | 412 |
| Y | Internal Face and Bypass | 15 1/2 | 300 | 342 |
| Z | Face Damper | 15 1/2 | 345 | 387 |
| AA | Horizontal Fan | 54 3/4 | | |
| | | FC Fan | 1097 | 1180 |
| | | BI Fan | 1475 | 1528 |
| | | Plug Fan | 1298 | 1616 |
| | | Q-Fan | | |
| | | Q | 1194 | 1277 |
| | | R | 1328 | 1411 |
| AB | Diffuser | 15 1/2 | 167 | 209 |
| AC | Top-Mounted Discharge Plenum | 54 3/4<br>H = 40 | N/A | 452 |
| AD | Front-Mounted Discharge Plenum | 40 | N/A | 452 |
| AE | Multizone/Double Duct | 71<br>H = 77 3/4 | 832 | 1042 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-50 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| **1/2" Unit Coils** UW,UU,UF | 24.40 | 1-51x69 |
| 6 Row UU | 20.70 | 1-18x68<br>1-24x68 |
| **Shipping Coils** | | |
| Full | 19.80 | 1-18x68<br>1-24x68 |
| Custom | 21.90<br>1-24x75 | 1-18x75<br>1-24x68 |
| Custom Extra Full W | 25.00 | 1-48x75 |
| Modified | 17.00 | 2-18x68 |
| Hot Deck | 11.30 | 1-24x68 |

**Table U-51 — Coil Availability**

| Module Size | 1/2" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-2 Row |
| Medium | 2-8 Row<br>*except | 1-4 Row |
| Medium Large | | |
| Coil | 6 Row UU | 1-8 Row |
| Coil w/Access | 2-8 Row* | 1-4 Row |
| Vertical | 2-8 Row* | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row | 1-4 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-52 — 1/2" Unit Coil Water Connection Sizes (Inches)**

| | UW/UU | 6 Row UU |
|---|---|---|
| Header Height | 51 | 1-18<br>1-24 |
| Supply | 2 1/2 | 2 1/2 |
| Return | 2 1/2 | 2 1/2 |
| Drain & Vent | 3/8 | 3/8 |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-53 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2",4" Flat (TA, permanent, pleated media) | 25.0 | 4-20x25<br>4-16x25 |
| Angled (TA, permanent, pleated media) | 38.9 | 4-20x20<br>8-20x25 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 24.0 | 6-24x24 |

Refer to page 78 for filter pressure drops.

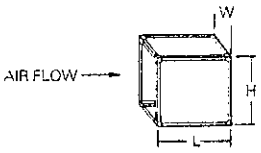
**Table U-54 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 6.28 |
| Airfoil Blade Damper | 16.08 |
| Internal Face and Bypass | |
| Face Area | 15.52 |
| Bypass Area | 2.59 |
| External Face and Bypass | |
| Face Area | 21.92 |
| Bypass Area | 5.18 |
| Face Damper | 21.92 |
| Multizone (per deck) | 8.02 |
| (Max. zones/deck) | 12 |
| Air Blender | 8.96 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

# Unit Sizes

Size 30 KITCHEN




| | Module | H = 74<br>W = 120<br>L | Weights<br>Single Wall | Double Wall |
|---|---|---|---|---|
| A | Intake Module | 19 | 572 | 572 |
| B | Traq Damper Mixing Box | 48 | 969 | 1244 |
| C | Mixing/Filter-Mixing Box | 48 | 969 | 1244 |
| D | Economizer | 48 | 730 | 851 |
| E | Air Blender | 43 1/2 | 956 | 1226 |
| F | Open Return Filter | 4 | 66 | 66 |
| G | Flat Filter | 14 1/2 | 301 | 359 |
| H | Angled Filter | 31 | 420 | 492 |
| I | Bag Filter | 48 | 652 | 1085 |
| J | Cartridge Filter | 31 | 384 | 472 |
| K | Small Inspection or Blank | 14 1/2 | 214 | 271 |
| L | Medium Access or Blank | 19 | 241 | 315 |
| M | Medium Large Access or Blank | 31 | 301 | 373 |
| N | Large Access or Blank | 48 | 530 | 716 |
| O | Extra Large Access or Blank | 68 1/2 | 666 | 931 |
| P | Turning or Vertical Blank | 48 | 571 | 860 |
| Q | Small Horizontal Coil | 14 1/2 | 248 | 305 |
| R | Medium Horizontal Coil | 19 | 282 | 356 |
| S | Medium Large Horizontal Coil | 31 | 374 | 462 |
| T | Large Horizontal Coil | 48 | 619 | 805 |
| U | Vertical Coil | 48 | 571 | 860 |
| V | Coil w/Access | 31 | 2278 | 2366 |
| W | Moisture Eliminator | 14 1/2 | 557 | 614 |
| X | External Face and Bypass | 19<br>H = 79 | 729 | 803 |
| Y | Internal Face and Bypass | 19 | 616 | 591 |
| Z | Face Damper | 19 | 584 | 658 |
| AA | Horizontal Fan | 68 1/2 | | |
| | | FC Fan | 2370 | 2706 |
| | | AF Fan | 2688 | 3024 |
| | | Plug Fan | 2390 | 2726 |
| | | Q-Fan | | |
| | | Q | 2897 | 3233 |
| | | R | 3175 | 3511 |
| AB | Diffuser | 19 | 379 | 454 |
| AC | Top-Mounted Discharge Plenum | 74<br>H = 48 | N/A | 788 |
| AD | Front-Mounted Discharge Plenum | 48 | N/A | 788 |
| AE | Multizone/Double Duct | 86<br>H = 102 | 1761 | 2125 |

Fan module weights include largest ODP motor and IGV when applicable. Coil module weights includes the coil module only, add coil weights separately.

**Table U-74 — Coil Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| **1/2" Unit Coils** UW,UU,UF | 49.43 | 2-32x110 |
| 6 Row UU | 49.20 | 1-30x109<br>1-33x109 |
| **Shipping Coils** | | |
| Full | 47.69 | 1-30x109<br>1-33x109 |
| Modified | 36.33 | 2-24x109 |
| Hot Deck | 25.00 | 1-33x109 |

**Table U-75 — Coil Availability**

| Module Size | 1/2" Unit Coil | Shipping Coils |
|---|---|---|
| Small | 2 Row | 1-3 Row |
| Medium | 2-8 Row | 1-6 Row |
| Medium Large | | |
| Coil | N/A | 1-8 Row |
| Coil w/Access | 2-8 Row | 1-6 Row |
| Vertical | 2-8 Row | 1-6 Row |
| Multizone | | |
| Cold Deck | 2-8 Row | 1-6 Row |
| Hot Deck | N/A | 1-2 Row |

**Table U-76 — 1/2" Unit Coil Water Connection Sizes (Inches)**

| | UW/UU | 6 Row UU |
|---|---|---|
| Header Height | 2-32 | 1-30<br>1-33 |
| Supply | 2 | 2 1/2 |
| Return | 2 | 2 1/2 |
| Drain & Vent | 3/8 | 3/8 |

Shipping Coil connections are located on page 64. See pages 64-73 for Refrigerant Coil Connections and Circuiting.

**Table U-77 — Filter Data**

| | Area (Ft²) | Qty-Size |
|---|---|---|
| 2", 4" Flat (TA, permanent, pleated media) | 48.3 | 12-20x25<br>3-16x20 |
| Angled (TA, permanent, pleated media) | 80.6 | 20-20x25<br>4-16x25 |
| Bag/Cartridge (65%, 85% or 95% Efficiency) | 54.8 | 8-24x24<br>6-24x20<br>1-20x20 |

Refer to page 78 for filter pressure drops.

**Table U-78 — Areas**

| | Area (Ft²) |
|---|---|
| Traq Damper Mixing Box, Mixing Box or Economizer | |
| Traq Damper | 12.83 |
| Airfoil Blade Damper | 27.86 |
| Internal Face and Bypass | |
| Face Area | 31.55 |
| Bypass Area | 7.88 |
| External Face and Bypass | |
| Face Area | 43.38 |
| Bypass Area | 7.89 |
| Face Damper | 43.38 |
| Multizone (per deck) | 15.60 |
| (Max. zones/deck) | 19 |
| Air Blender | 19.80 |

Refer to pages 74-79 for pressure drops. See Table P-14 on page 79 for damper torque requirements.

# PUMPS

## CHILLED WATER PUMP (2 EA.)

| PIPE SIZE | FT. OF PIPE | HEAD LOSS FT./100 FT. | HEAD LOSS (FT.) |
|---|---|---|---|
| 8" | 1080 | 1.4 | 15.12 |
| 6" | 520 | 1.8 | 9.36 |
| 4" | 420 | 5.0 | 21.0 |
| 3" | 390 | 4.0 | 15.6 |
| 2" | 128 | 8.9 | 11.39 |
| | | | 72.47 TOTAL |

72.47 × 1.5 (VALVES + FITTINGS) = 108.70
+ 12.00 (CHILLER)
120.70
+ 10% (SAFETY FACTOR)
132.77 HEAD (FT.)

480 GPM

## CONDENSER WATER PUMP (2 EA.)

| PIPE SIZE | FT. OF PIPE | HEAD LOSS FT./100 FT. | HEAD LOSS (FT.) |
|---|---|---|---|
| 8" | 180 | 1.4 | 2.52 |

2.52 × 1.5 (VALVES + FITTINGS) = 3.78
+ 12.00 (VERTICAL LOSS, COOLING TOWER)
+ 17.00 (CONDENSER)
32.78
+ 10% (SAFETY FACTOR)
36.05 HEAD (FT.)

600 GPM

| | | |
|---|---|---|
| THERMAL ENGINEERING CORPORATION | SUBJECT: CHILLED + CONDENSER WATER PUMPS | DATE [illegible] BY [illegible] SHEET 1 OF 1 JOB NO [illegible] |

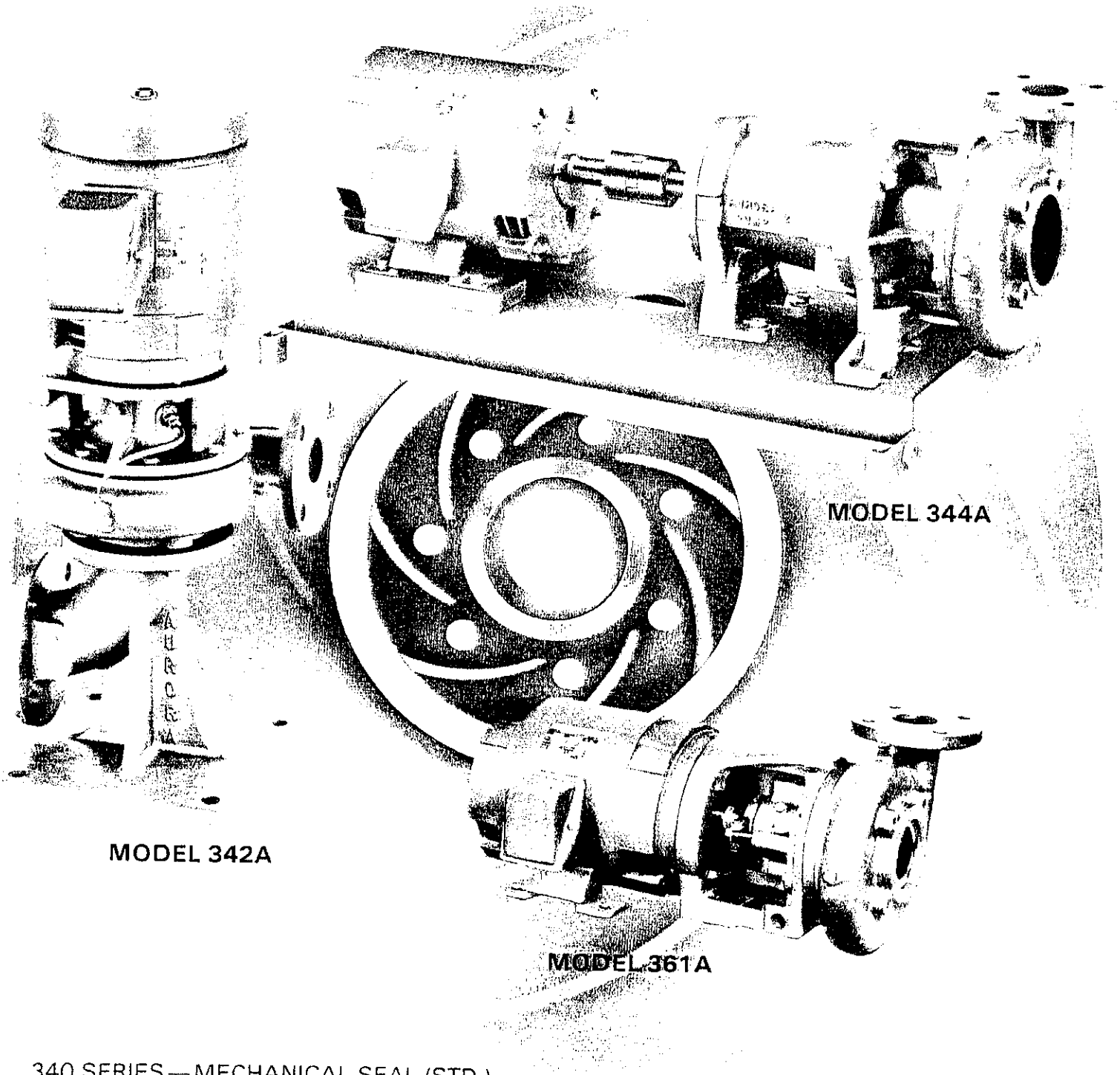
A UNIT OF GENERAL SIGNAL

# AURORA PUMP

BULLETIN 340/360F

## 340-360 SERIES SINGLE STAGE END SUCTION PUMPS

CAPACITIES TO 4500 G.P.M.
HEADS TO 360 FEET
TEMPERATURES TO 300° F.




340 SERIES—MECHANICAL SEAL (STD.)

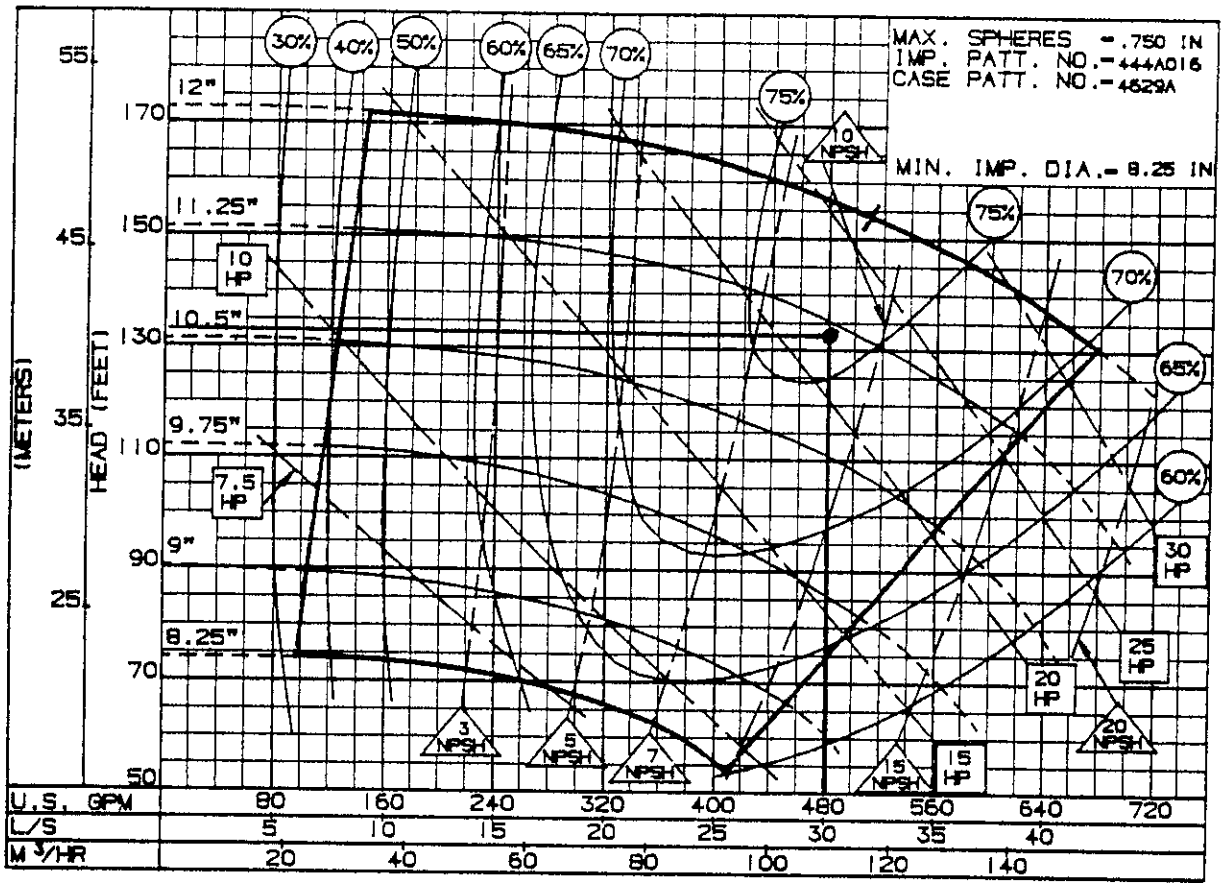
360 SERIES—PACKING (STD.)

CHILLED WATER PUMP

# 3 x 4 x 12 SERIES 340 or 360

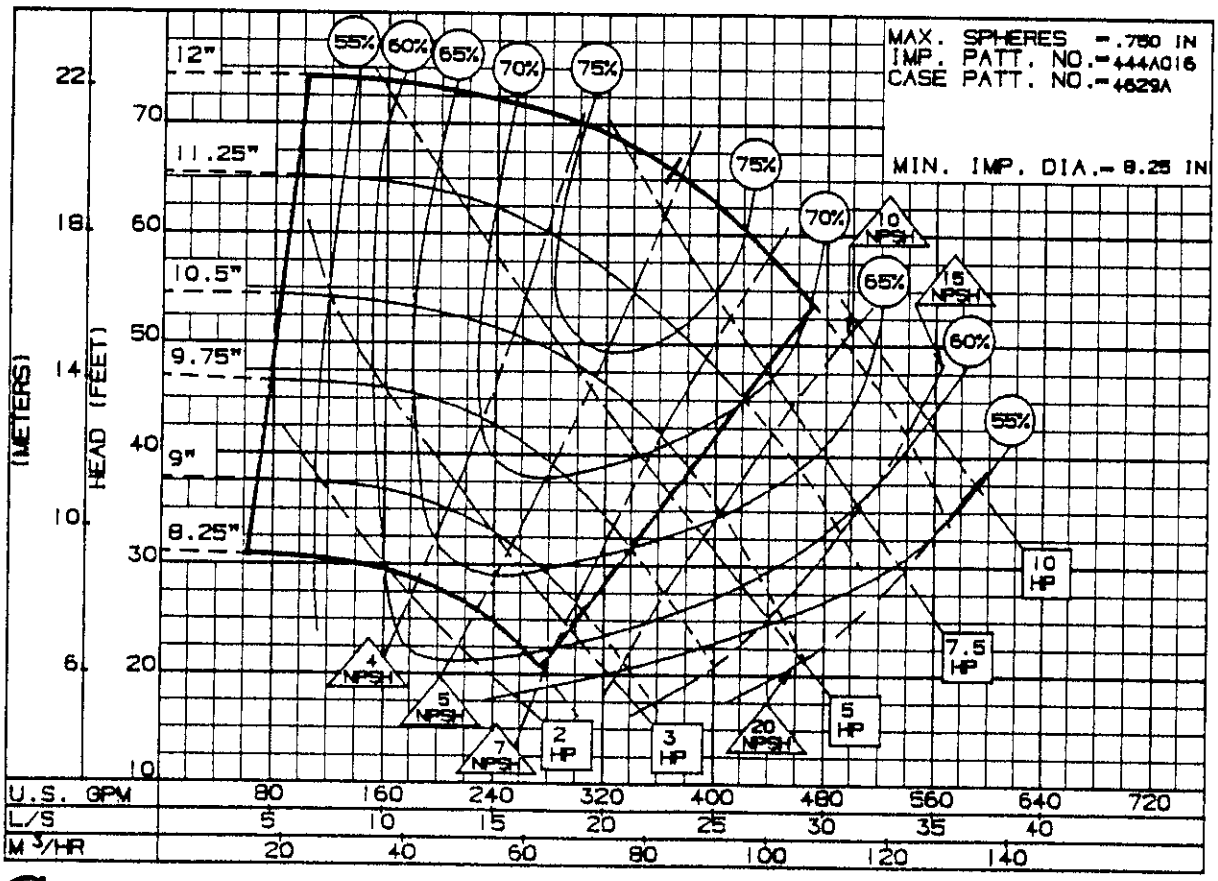
## ENCLOSED IMPELLER






1750 R.P.M.

3PC-116303




1150 R.P.M.

3PC-116304

AURORA PUMP
A UNIT OF GENERAL SIGNAL
800 AIRPORT ROAD • NORTH AURORA ILLINOIS 60542

CONDENSER WATER PUMP

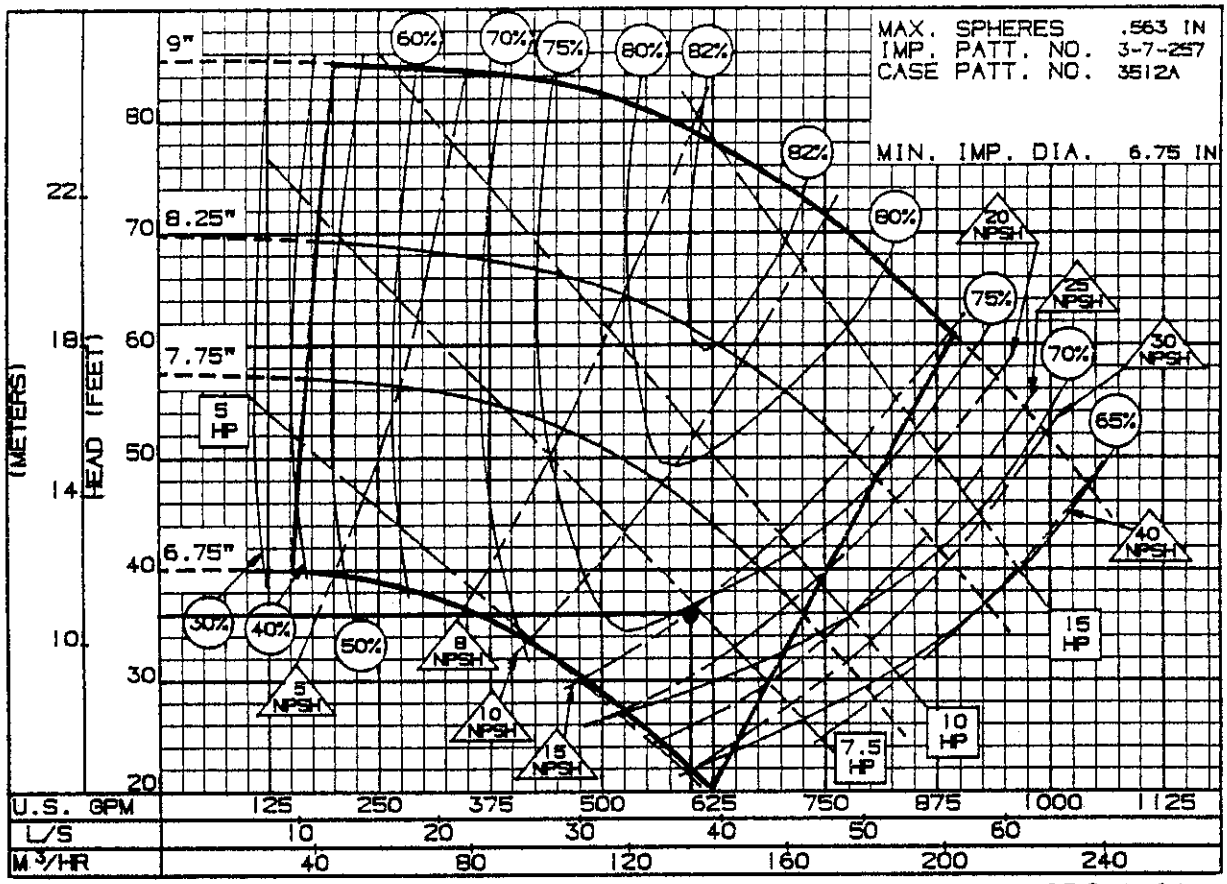


DATED MARCH 1989
SUPERSEDES PAGE 426
DATED JUNE 1987

# 4 x 5 x 9B SERIES 340 or 360

## ENCLOSED IMPELLER

1750 R.P.M.




3PC-116311

# FANS

KITCHEN

# Greenheck

JOB: QUAD C

10/23/2002

## Kitchen Ventilation

MARK: EF1

# SWB Backward Inclined Centrifugal Utility Fan

### ENGINEERING DATA

| Appro. Fan Weight (lb.) | Max. T Motor Frame Size |
|---|---|
| 1,170 | 286 |

| Drive Type |
|---|
| Variable |

### CONFIGURATION

| Arrangement | Rotation | Discharge Position |
|---|---|---|
| 10 | CW | UB |

### INSTALLATION

| Air Stream Temp. (°F) |
|---|
| 85 |

### STANDARD CONSTRUCTION FEATURES

HOUSING: Heavy gauge steel housing with Lock-seam construction • Unit support angles with prepunched mounting holes • Adjustable motor plate • Corrosion resistant fasteners • Entire unit is phosphatized and coated.

BEARINGS, SHAFT, AND WHEEL: Heavy duty lubricatable, self-aligning ball bearing pillow blocks • Polished, solid steel shafts • Backward inclined fan wheel (Fans with EXP. motors include: aluminum wheel, aluminum rub ring, and shaft seal)

### SELECTED OPTIONS & ACCESSORIES

Permatector - Standard Coating on Entire Fan
Steel Wheel Construction
Two Groove Pulley and Belt System

### MOTOR SPECS

| Size (hp.) | RPM | V/C/P | Enclosure | Motor Frame Size |
|---|---|---|---|---|
| 20 | 1725 | 208/60/3 | ODP | 256 |

### PERFORMANCE

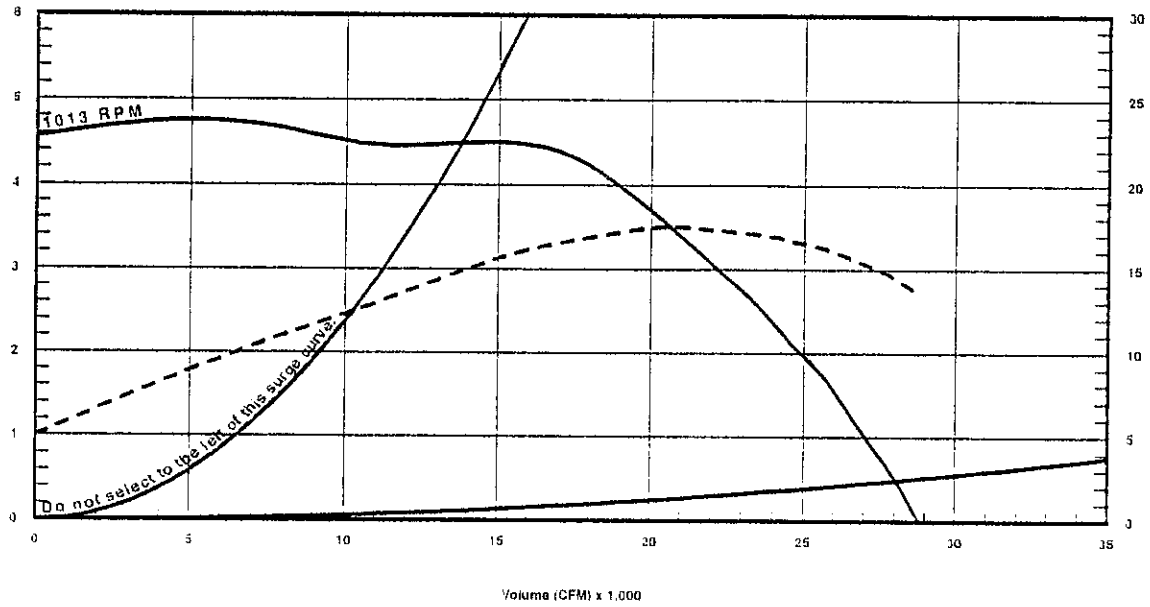
Elevation ft. = 0 Drive Loss (%)

| Qty. | Model | Volume (CFM) | SP (in. wg) | CSP (in. wg) | TS (ft./min) | OV (ft./min) | FRPM | Operating Power (hp.) | SE % |
|---|---|---|---|---|---|---|---|---|---|
| 1 | SWB-236-200 | 28,000 | 0.5 | 0.5 | 9,680.0 | 3,794.0 | 1,013 | 14.41 | 15 |

### SOUND

| Inlet Sound Power by Octave Band | | | | | | | | LwA | dBA | Noise Criteria |
|---|---|---|---|---|---|---|---|---|---|---|
| 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| 94 | 96 | 96 | 92 | 89 | 86 | 80 | 73 | 95 | 84 | 79 |

LwA - A weighted sound power level, based on ANSI S1.4. dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5.0 ft. Noise Criteria (NC) based on an average attenuation of 11.5 dB per octave band at 5.0 ft.

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JOB: QUAD C

Greenheck 10/23/2002

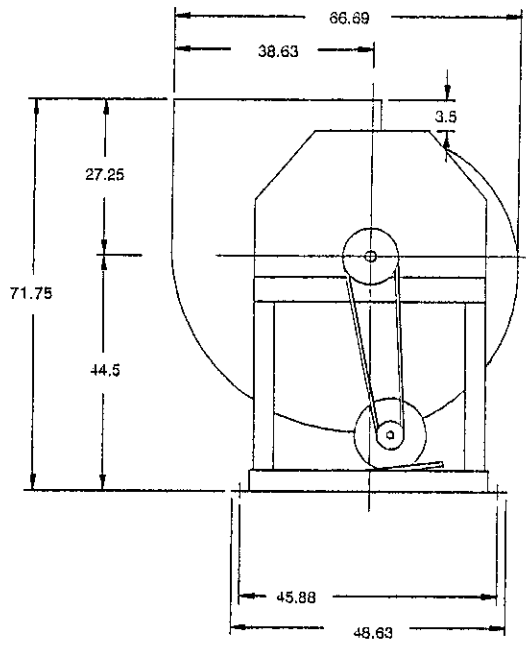
Kitchen Ventilation

MARK: EF1

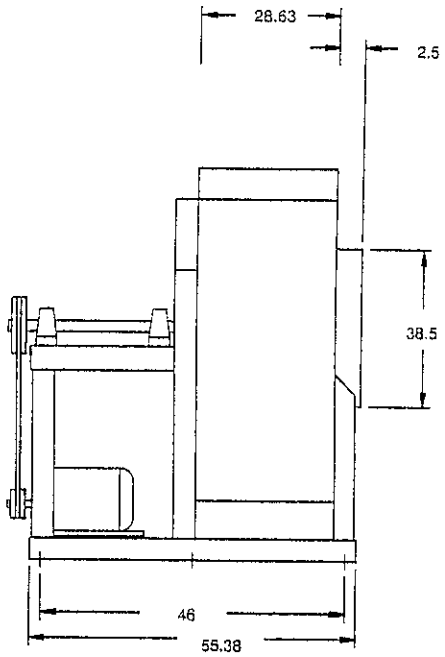
Size: 36
Arrangement: 10

# SWB Backward Inclined Centrifugal Utility Fan

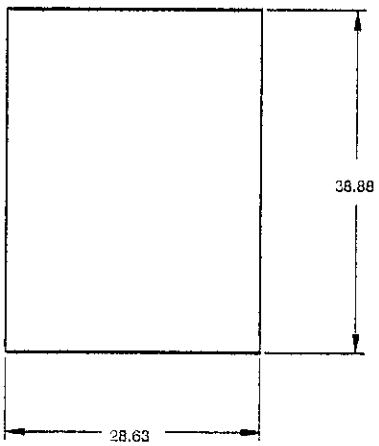
NOTES: All dimensions shown are in units of inches.



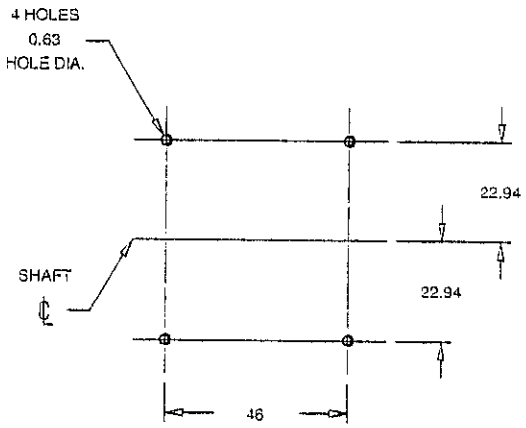

SIDE VIEW




END VIEW




OUTLET




FOOTPRINT

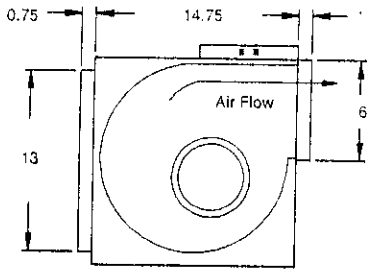
TYPICAL CABINET EXHAUST FAN

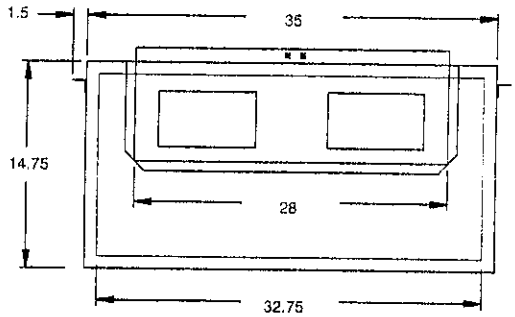
**Greenheck** 12/19/2002

**JOB:** QUAD C

## Fan and Ventilator

**MARK:** EF2




** Optional Discharge Position

NOTES: All dimensions shown are in units of inches

Fan weight is without accessories

# CSP Inline Cabinet Fan

### CONSTRUCTION FEATURES

• Galvanized steel housing • Sound absorbing insulation • Outlet duct collar with integral backdraft damper • Forward curved wheel • Plug type disconnect • Adjustable mounting brackets • Square duct connection • Dual scroll design • Field rotatable discharge

### SELECTED OPTIONS & ACCESSORIES

Motor w/ Thermal Overloads
UL/cUL-507 - "Electric Fans"
Solid State Speed Control - 10WSSC, Shipped Loose

### DIMENSIONS

| Appro. Fan Weight (lb.) |
|---|
| 68 |

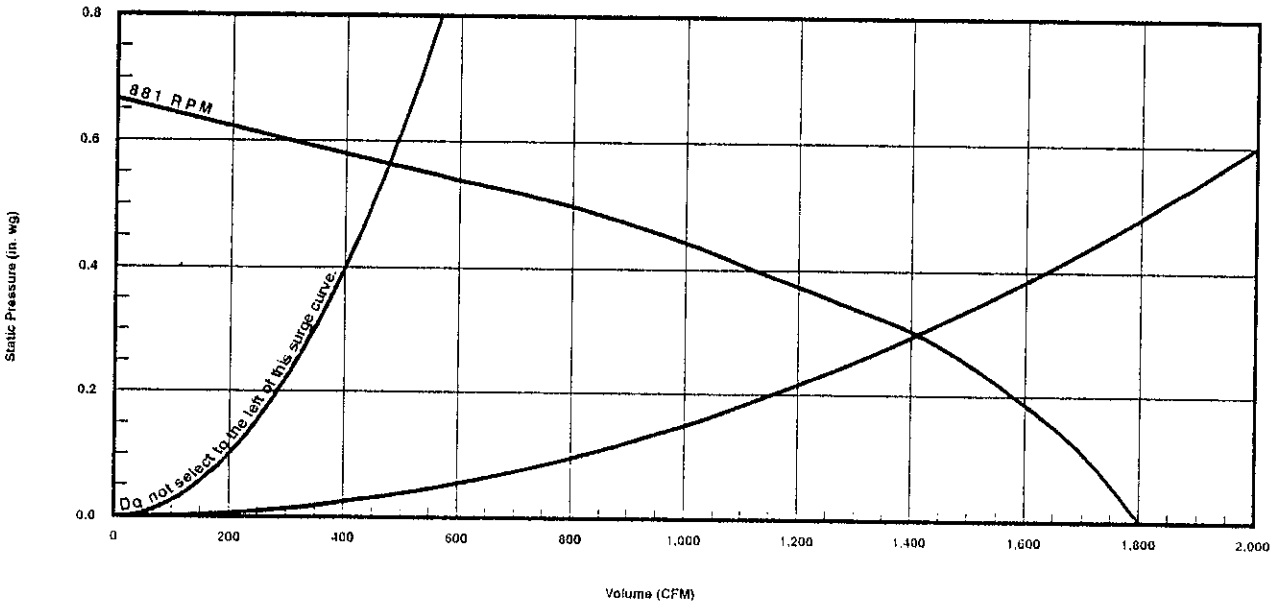
### PERFORMANCE (Elevation ft. = 0, Airstream Temperature °F = 80)

| Qty | Model | Volume (CFM) | SP (in. wg) | FRPM | Input Operating Power (W) | Motor Information | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | V/C/P | Enclosure | RPM |
| 1 | CSP-275 | 1,400 | 0.3 | 881 | 735 | 115/60/1 | ODP | 1100 |

### SOUND

| Inlet Sound Power by Octave Band | | | | | | | | Lwa | dBA | Sones |
|---|---|---|---|---|---|---|---|---|---|---|
| 62.5 | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 | | | |
| 69 | 70 | 63 | 56 | 53 | 45 | 45 | 41 | 60 | 49 | 5.3 |

LwA - A weighted sound power level, based on ANSI S1.4.
dBA - A weighted sound pressure level, based on 11.5 dB attenuation per octave band at 5.0 ft. Sones calculated using AMCA 301 at 5.0 ft.




amca CERTIFIED RATINGS SOUND AND AIR PERFORMANCE AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL, INC.

# PLUMBING CALCULATIONS

## PLUMBING FIXTURE SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

| PLUMBING FIXTURE | BLDG 355 | BLDG 356 | BLDG 357 | BLDG 358 | TOTAL |
|---|---|---|---|---|---|
| WATER CLOSET | 47 | 96 | 65 | 96 | 304 |
| URINAL | 19 | 0 | 26 | 0 | 45 |
| LAVATORY | 46 | 96 | 49 | 96 | 287 |
| SHOWER | 15 | 84 | 24 | 84 | 207 |
| SINK | 1 | 84 | 3 | 84 | 172 |
| SERVICE SINK | 3 | 9 | 3 | 9 | 24 |
| ELECTRIC WATER COOLER | 6 | 6 | 6 | 6 | 24 |
| HOSE BIBB | 20 | 12 | 20 | 12 | 64 |
| FLOOR DRAIN | 8 | 0 | 20 | 0 | 28 |
| FLOOR SINK | 8 | 6 | 10 | 6 | 30 |
| WASHER | 0 | 18 | 0 | 18 | 36 |
| LAUNDRY TRAY | 0 | 3 | 0 | 3 | 6 |
| | | | | | |

## PLUMBING FIXTURE UNIT SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

**PROJECT SUMMARY**

| FIXTURE TYPE | QUANTITY | SANITARY | | COLD WATER | | HOT WATER | |
|---|---|---|---|---|---|---|---|
| | | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU |
| WATER CLOSET | 304 | 6 | 1824 | 4 | 1216 | 0 | 0 |
| URINAL | 45 | 5 | 225 | 5 | 225 | 0 | 0 |
| LAVATORY | 287 | 1 | 287 | 1 | 287 | 1 | 287 |
| SHOWER | 207 | 2 | 414 | 2 | 414 | 2 | 414 |
| SINK | 172 | 2 | 344 | 1.5 | 258 | 1.5 | 258 |
| SERVICE SINK | 24 | 3 | 72 | 3 | 72 | 3 | 72 |
| ELECTRIC WATER COOLER | 24 | 0.5 | 12 | 0.75 | 18 | 0 | 0 |
| HOSE BIBB | 64 | 0 | 0 | 2.5 | 160 | 0 | 0 |
| FLOOR DRAIN | 28 | 2 | 56 | 0 | 0 | 0 | 0 |
| FLOOR SINK | 30 | 1 | 30 | 0 | 0 | 0 | 0 |
| WASHER | 36 | 3 | 108 | 4 | 144 | 4 | 144 |
| LAUNDRY TRAY | 6 | 2 | 12 | 2 | 12 | 2 | 12 |
| KITCHEN | 1 | 150 | 150 | 150 | 150 | 75 | 75 |
| **Subtotal** | | | 3534 | | 2956 | | 1262 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **FLOWRATE - GPM** | | | 420 | gpm | 241 | gpm |
| **FLOWRATE - L/S** | | | 26.5 | L/s | 15.2 | L/s |
| **MINIMUM LINE SIZE - IN.** | 8 | in. | 6 | in. | 6 | in. |
| **MINIMUM LINE SIZE - MM** | 200 | mm | 150 | mm | 150 | mm |

## PLUMBING FIXTURE UNIT SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

**BLDG 355**

| FIXTURE TYPE | QUANTITY | SANITARY | | COLD WATER | | HOT WATER | |
|---|---|---|---|---|---|---|---|
| | | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU |
| WATER CLOSET | 47 | 6 | 282 | 4 | 188 | 0 | 0 |
| URINAL | 19 | 5 | 95 | 5 | 95 | 0 | 0 |
| LAVATORY | 46 | 1 | 46 | 1 | 46 | 1 | 46 |
| SHOWER | 15 | 2 | 30 | 2 | 30 | 2 | 30 |
| SINK | 1 | 2 | 2 | 1.5 | 1.5 | 1.5 | 1.5 |
| SERVICE SINK | 3 | 3 | 9 | 3 | 9 | 3 | 9 |
| ELECTRIC WATER COOLER | 6 | 0.5 | 3 | 0.75 | 4.5 | 0 | 0 |
| HOSE BIBB | 20 | 0 | 0 | 2.5 | 50 | 0 | 0 |
| FLOOR DRAIN | 8 | 2 | 16 | 0 | 0 | 0 | 0 |
| FLOOR SINK | 8 | 1 | 8 | 0 | 0 | 0 | 0 |
| WASHER | 0 | 3 | 0 | 4 | 0 | 4 | 0 |
| LAUNDRY TRAY | 0 | 2 | 0 | 2 | 0 | 2 | 0 |
| | | | | | | | |
| **Subtotal** | | | 491 | | 424 | | 86.5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **FLOWRATE - GPM** | | | 130 | gpm | 40 | gpm |
| **FLOWRATE - L/S** | | | 8.2 | L/s | 2.5 | L/s |
| **MINIMUM LINE SIZE - IN.** | 8 | in. | 4 | in. | 2 | in. |
| **MINIMUM LINE SIZE - MM** | 200 | mm | 100 | mm | 50 | mm |

## PLUMBING FIXTURE UNIT SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

**BLDG 356**

| FIXTURE TYPE | QUANTITY | SANITARY | | COLD WATER | | HOT WATER | |
|---|---|---|---|---|---|---|---|
| | | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU |
| WATER CLOSET | 96 | 6 | 576 | 4 | 384 | 0 | 0 |
| URINAL | 0 | 5 | 0 | 5 | 0 | 0 | 0 |
| LAVATORY | 96 | 1 | 96 | 1 | 96 | 1 | 96 |
| SHOWER | 84 | 2 | 168 | 2 | 168 | 2 | 168 |
| SINK | 84 | 2 | 168 | 1.5 | 126 | 1.5 | 126 |
| SERVICE SINK | 9 | 3 | 27 | 3 | 27 | 3 | 27 |
| ELECTRIC WATER COOLER | 6 | 0.5 | 3 | 0.75 | 4.5 | 0 | 0 |
| HOSE BIBB | 12 | 0 | 0 | 2.5 | 30 | 0 | 0 |
| FLOOR DRAIN | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| FLOOR SINK | 6 | 1 | 6 | 0 | 0 | 0 | 0 |
| WASHER | 18 | 3 | 54 | 4 | 72 | 4 | 72 |
| LAUNDRY TRAY | 3 | 2 | 6 | 2 | 6 | 2 | 6 |
| | | | | | | | |
| **Subtotal** | | | 1104 | | 913.5 | | 495 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **FLOWRATE - GPM** | | | 198 | gpm | 124 | gpm |
| **FLOWRATE - L/S** | | | 12.5 | L/s | 7.8 | L/s |
| **MINIMUM LINE SIZE - IN.** | 8 | in. | 5 | in. | 4 | in. |
| **MINIMUM LINE SIZE - MM** | 200 | mm | 125 | mm | 100 | mm |

## PLUMBING FIXTURE UNIT SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

**BLDG 357**

| FIXTURE TYPE | QUANTITY | SANITARY | | COLD WATER | | HOT WATER | |
|---|---|---|---|---|---|---|---|
| | | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU |
| WATER CLOSET | 65 | 6 | 390 | 4 | 260 | 0 | 0 |
| URINAL | 26 | 5 | 130 | 5 | 130 | 0 | 0 |
| LAVATORY | 49 | 1 | 49 | 1 | 49 | 1 | 49 |
| SHOWER | 24 | 2 | 48 | 2 | 48 | 2 | 48 |
| SINK | 3 | 2 | 6 | 1.5 | 4.5 | 1.5 | 4.5 |
| SERVICE SINK | 3 | 3 | 9 | 3 | 9 | 3 | 9 |
| ELECTRIC WATER COOLER | 6 | 0.5 | 3 | 0.75 | 4.5 | 0 | 0 |
| HOSE BIBB | 20 | 0 | 0 | 2.5 | 50 | 0 | 0 |
| FLOOR DRAIN | 20 | 2 | 40 | 0 | 0 | 0 | 0 |
| FLOOR SINK | 10 | 1 | 10 | 0 | 0 | 0 | 0 |
| WASHER | 0 | 3 | 0 | 4 | 0 | 4 | 0 |
| LAUNDRY TRAY | 0 | 2 | 0 | 2 | 0 | 2 | 0 |
| KITCHEN | 1 | 150 | 150 | 150 | 150 | 75 | 75 |
| **Subtotal** | | | 835 | | 705 | | 185.5 |
| **FLOWRATE - GPM** | | | | | 171 | gpm | 62 gpm |
| **FLOWRATE - L/S** | | | | | 10.8 | L/s | 3.9 L/s |
| **MINIMUM LINE SIZE - IN.** | | | 8 | in. | 5 | in. | 3 in. |
| **MINIMUM LINE SIZE - MM** | | | 200 | mm | 125 | mm | 80 mm |

## PLUMBING FIXTURE UNIT SUMMARY

**PROJECT:** QUAD C
**TEC JOB NO.:** 02030
**DESIGNED BY:** THERMAL ENGINEERING CORPORATION
**PREPARED BY:** RKS
**DATE:** 28-Mar-03
**PROJECT STATUS:** FINAL

**BLDG 358**

| FIXTURE TYPE | QUANTITY | SANITARY | | COLD WATER | | HOT WATER | |
|---|---|---|---|---|---|---|---|
| | | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU | FU/FIX | TOTAL FU |
| WATER CLOSET | 96 | 6 | 576 | 4 | 384 | 0 | 0 |
| URINAL | 0 | 5 | 0 | 5 | 0 | 0 | 0 |
| LAVATORY | 96 | 1 | 96 | 1 | 96 | 1 | 96 |
| SHOWER | 84 | 2 | 168 | 2 | 168 | 2 | 168 |
| SINK | 84 | 2 | 168 | 1.5 | 126 | 1.5 | 126 |
| SERVICE SINK | 9 | 3 | 27 | 3 | 27 | 3 | 27 |
| ELECTRIC WATER COOLER | 6 | 0.5 | 3 | 0.75 | 4.5 | 0 | 0 |
| HOSE BIBB | 12 | 0 | 0 | 2.5 | 30 | 0 | 0 |
| FLOOR DRAIN | 0 | 2 | 0 | 0 | 0 | 0 | 0 |
| FLOOR SINK | 6 | 1 | 6 | 0 | 0 | 0 | 0 |
| WASHER | 18 | 3 | 54 | 4 | 72 | 4 | 72 |
| LAUNDRY TRAY | 3 | 2 | 6 | 2 | 6 | 2 | 6 |
| | | | | | | | |
| **Subtotal** | | | 1104 | | 913.5 | | 495 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **FLOWRATE - GPM** | | | 198 | gpm | 124 | gpm |
| **FLOWRATE - L/S** | | | 12.5 | L/s | 7.8 | L/s |
| **MINIMUM LINE SIZE - IN.** | 8 | in. | 5 | in. | 4 | in. |
| **MINIMUM LINE SIZE - MM** | 200 | mm | 125 | mm | 100 | mm |

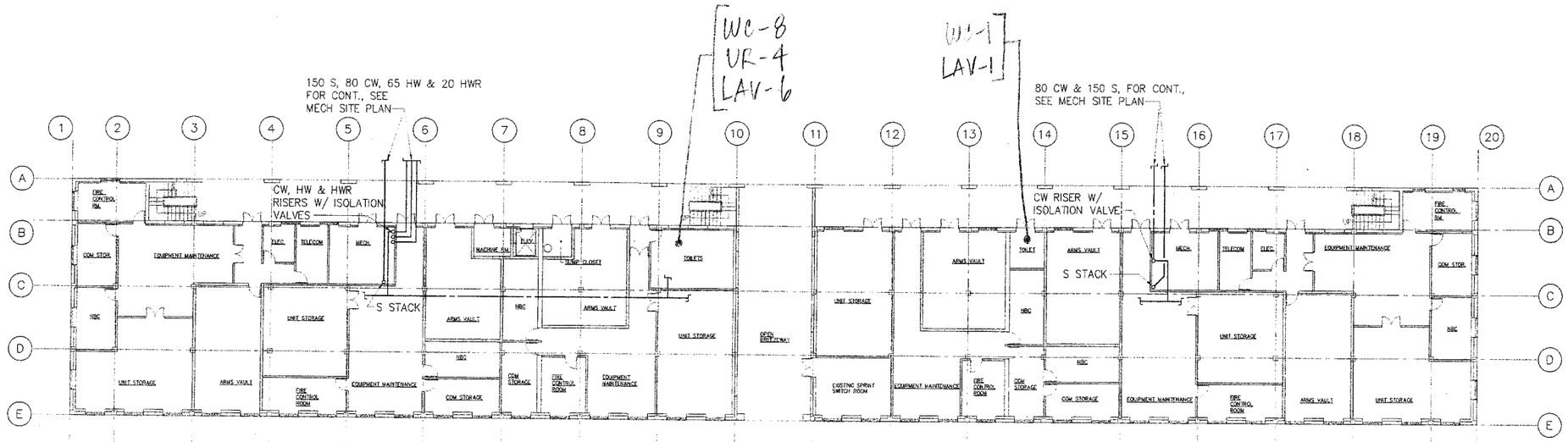
**2000 INTERNATIONAL PLUMBING CODE, MINIMUM PLUMBING FACILITIES**

| | |
|---|---|
| **PROJECT:** | QUAD C |
| **TEC JOB NO.:** | 02030 |
| **DESIGNED BY:** | THERMAL ENGINEERING CORPORATION |
| **PREPARED BY:** | STT |
| **DATE:** | 28-Mar-03 |
| **PROJECT STATUS:** | FINAL |

REFERENCE: SECTION 402, TABLE 403.1
OCCUPANCY: BUSINESS
POPULATION: 573 PEOPLE PER BUILDING

| | | | | |
|---|---|---|---|---|
| WATER CLOSETS: 1 PER 50 | 12 | PER BLDG | 48 | TOTAL REQUIRED |
| LAVATORIES: 1 PER 80 | 8 | PER BLDG | 32 | TOTAL REQUIRED |
| WATER COOLERS: 1 PER 100 | 7 | PER BLDG | 28 | TOTAL REQUIRED |
| SERVICE SINK: 1 | 1 | PER BLDG | 4 | TOTAL REQUIRED |

Note: The above quantities are for information only and not be used for the design.

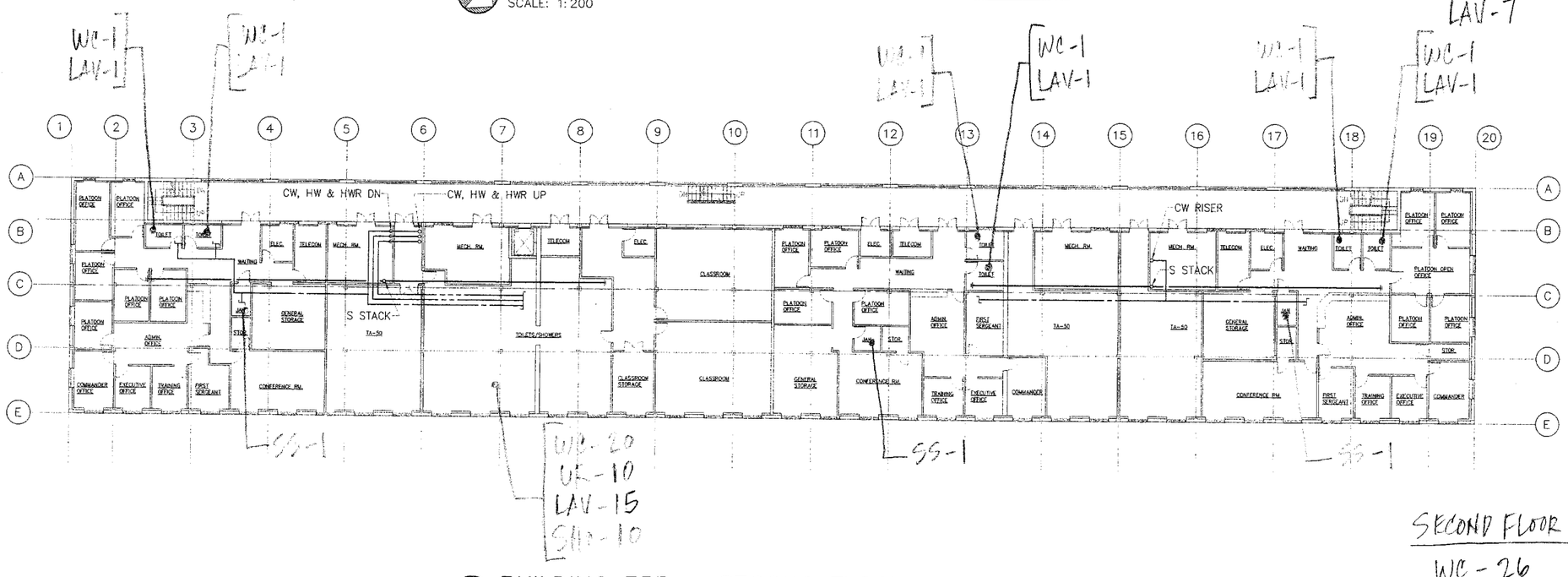



FIRST FLOOR TOTAL

WC-9
UR-4
LAV-7

## BUILDING 355 – FIRST FLOOR PLUMBING PLAN

SCALE: 1:200




## BUILDING 355 – SECOND FLOOR PLUMBING PLAN

SCALE: 1:200

SECOND FLOOR TOTAL

WC - 26
UR - 10
LAV - 21
SHO - 10
SS - 3

GRAPHIC SCALE

1

US Army Corps of Engineers

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD | LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

DRAWN BY: TEC
DATE: 17 MARCH 2003
CHECKED BY: KIM
FILENAME:
REVIEWED BY: KIM

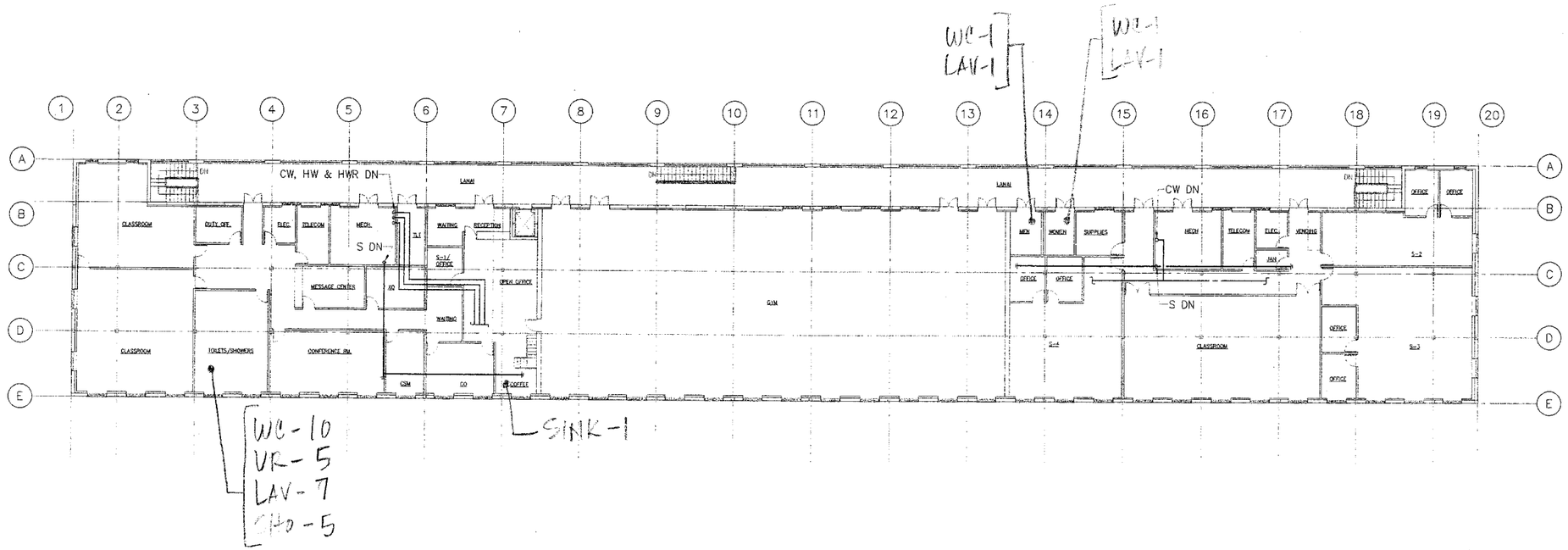
U.S. ARMY ENGINEERS DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

FY03 MCA PN 52068 WHOLE BARRACKS
RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 355 - FIRST AND SECOND FLOOR
PLUMBING PLANS

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:




## BUILDING 355 – THIRD FLOOR PLUMBING PLAN

SCALE: 1:200

THIRD FLOOR TOTAL

WC - 12
UR - 5
LAV - 9
SHO - 5
SINK - 1

2

GRAPHIC SCALE

US Army Corps of Engineers

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|---|

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|---|

DATE: 17 MARCH 2003
FILENAME:
DRAWN BY: TEC
CHECKED BY: KIM
REVIEWED BY: KIM

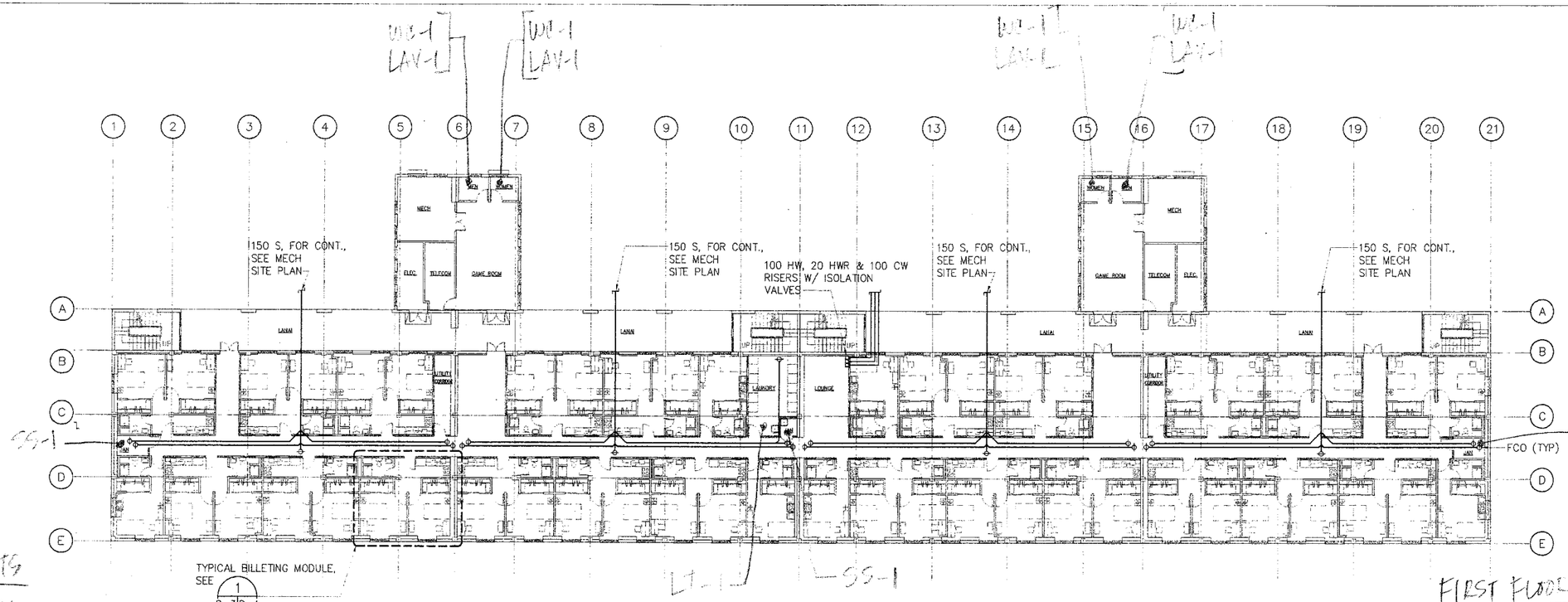
U.S. ARMY ENGINEERS, DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

FY03 MCA PN 52068 WHOLE BARRACKS RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 355 – THIRD FLOOR PLUMBING PLAN

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:




TYPICAL BILLETING MODULE, SEE 1 P-3|P-4

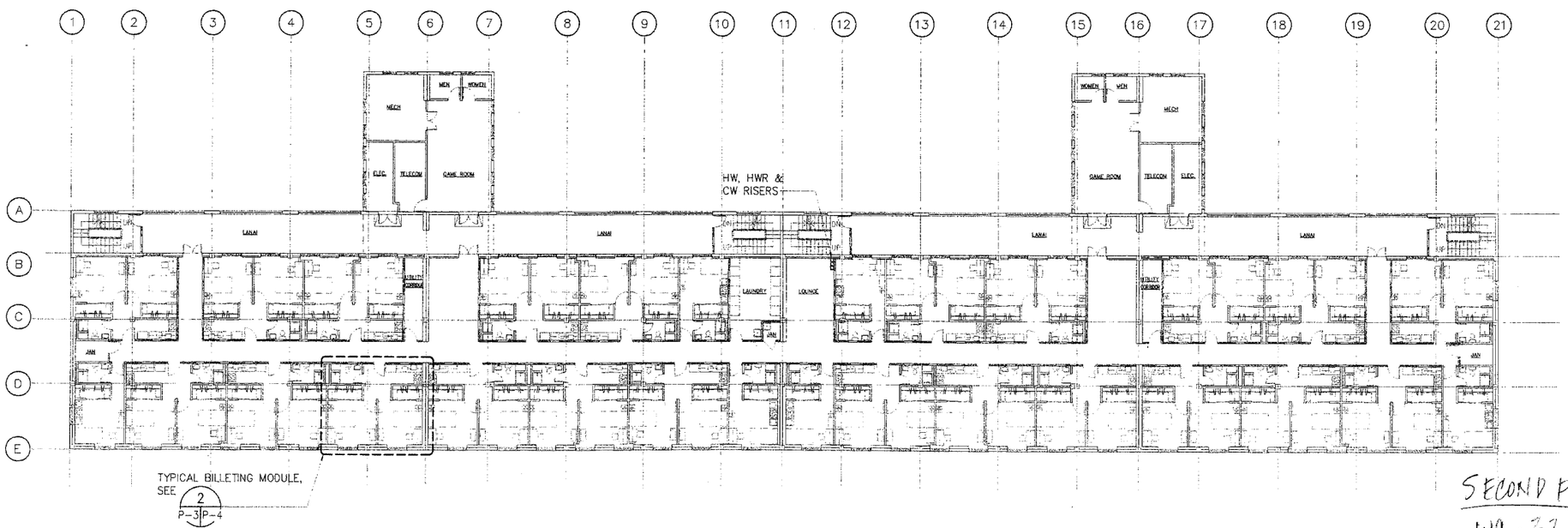
LIVING UNITS
WC - 25
LAV - 25
SHO - 28
SINK - 28

FIRST FLOOR TOTAL
WC - 32 SINK - 28
LAV - 32 SS - 3
SHO - 28 LT - 1

## BUILDING 356 & 358 – FIRST FLOOR PLUMBING PLAN

SCALE: 1:200

BUILDING 356 BUILDING 358




TYPICAL BILLETING MODULE, SEE 2 P-3|P-4

SECOND FLOOR TOTAL
WC - 32 LT - 1
LAV - 32
SHO - 33
SINK - 33
SS - 3

## BUILDING 356 & 358 – SECOND FLOOR PLUMBING PLAN

SCALE: 1:200

BUILDING 356 BUILDING 358

GRAPHIC SCALE

3

US Army Corps of Engineers

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD | LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

DRAWN BY: TEC
DATE: 17 MARCH 2003
CHECKED BY: KIM
REVIEWED BY: KIM
FILENAME:

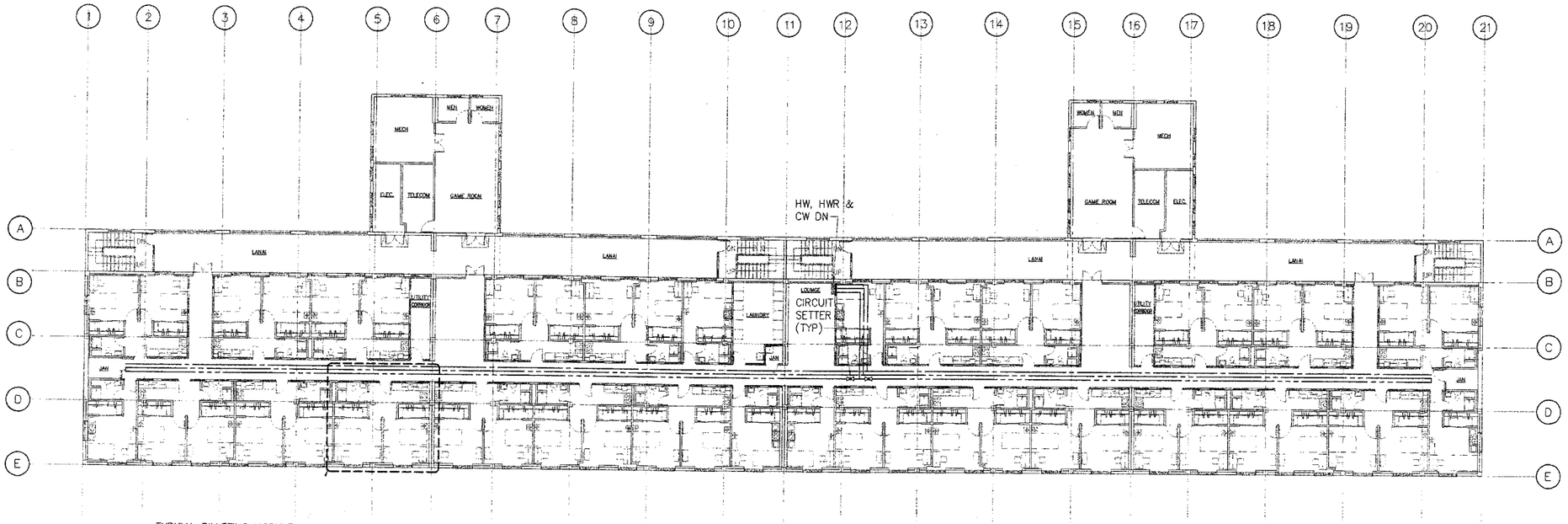
U.S. ARMY ENGINEERS DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

FY03 MCA PN 52068 WHOLE BARRACKS RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 356 & 358 – FIRST AND SECOND FLOOR PLUMBING PLANS

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:




TYPICAL BILLETING MODULE, SEE 2 P-4 P-4

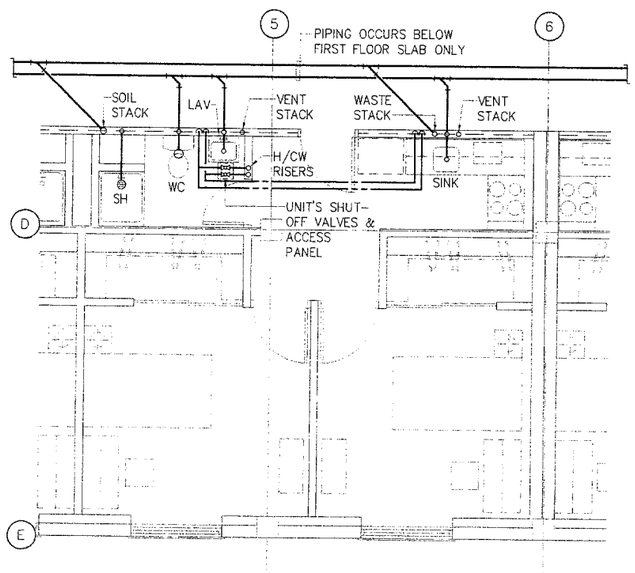
BUILDING 356 BUILDING 358

## BUILDING 356 & 358 – THIRD FLOOR PLUMBING PLAN

SCALE: 1:200

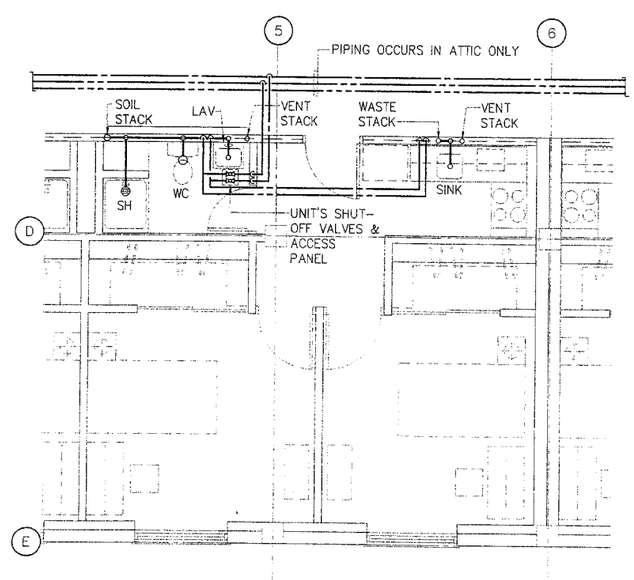
THIRD FLOOR TOTAL

WC - 32
LAV - 32
SH - 28
SINK - 28
SS - 3
LT - 1




## 1 DETAILED PLUMBING FLOOR PLAN

P-3 P-4 SCALE: 1:50




NOTE:
THIRD FLOOR CONDITION IS SHOWN, SECOND FLOOR CONDITION IS SIMILAR UNLESS NOTED OTHERWISE.

## 2 DETAILED PLUMBING FLOOR PLAN

P-4 SCALE: 1:50

GRAPHIC SCALE

0 2 4 6 8 10 20 M

1:200

4

US Army Corps of Engineers

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|---|

U.S. ARMY ENGINEERS DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

DRAWN BY: TEC
CHECKED BY: KIM
REVIEWED BY: KIM
DATE: 17 MARCH 2003
FILENAME:

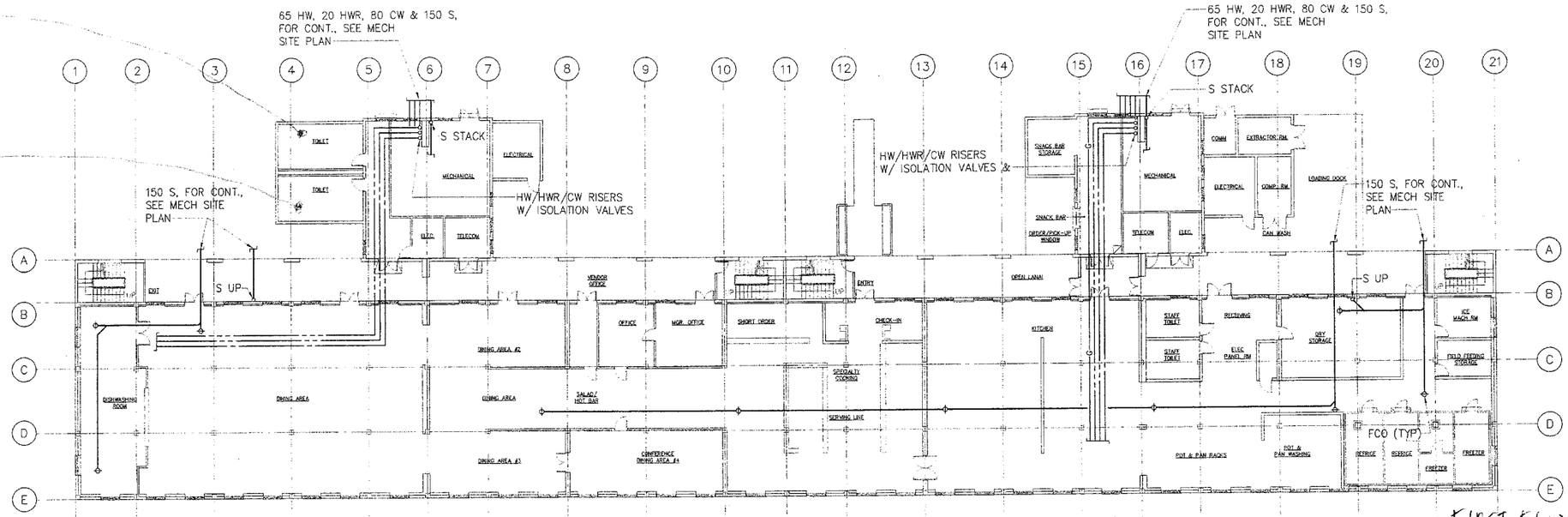
FY03 MCA PN 52068 WHOLE BARRACKS RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 356 & 358 – THIRD FLOOR AND DETAILED PLUMBING PLANS

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:

WC - 4
UR - 2
LAV - 3

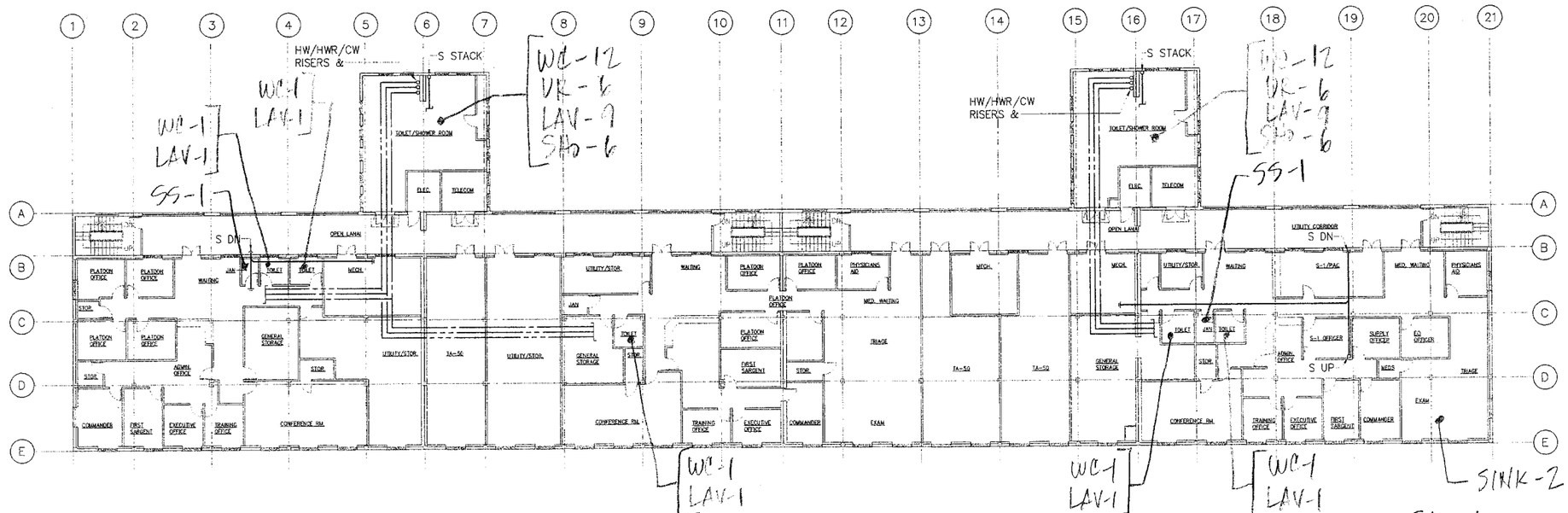
WC - 6
LAV - 3




## BUILDING 357 – FIRST FLOOR PLUMBING PLAN

SCALE: 1:200

FIRST FLOOR TOTAL
WC - 10
UR - 2
LAV - 6




## BUILDING 357 – SECOND FLOOR PLUMBING PLAN

SCALE: 1:200

SECOND FLOOR TOTAL
WC - 29
UR - 12
LAV - 23
SHO - 12
SINK - 2
SS-2

5

GRAPHIC SCALE

US Army Corps of Engineers

| ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|
| | | | | | |

| ZONE | DESCRIPTION | DATE | BY | CHKD | APVD |
|---|---|---|---|---|---|
| | | | | | |

DRAWN BY: TEC
DATE: 17 MARCH 2003
CHECKED BY: KIM
FILENAME:
REVIEWED BY: KIM

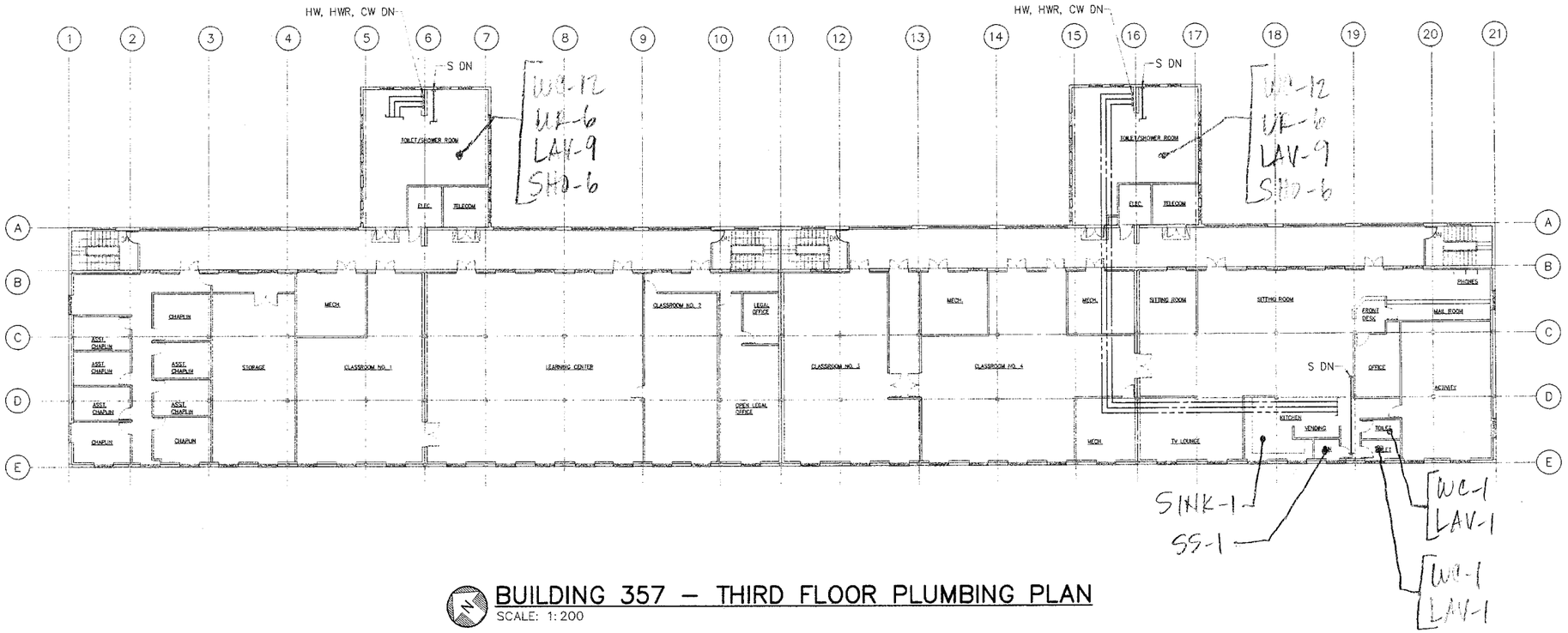
U.S. ARMY ENGINEERS DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

FY03 MCA PN 52068 WHOLE BARRACKS
RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 357 - FIRST AND SECOND FLOOR PLUMBING PLANS

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:




## BUILDING 357 – THIRD FLOOR PLUMBING PLAN

SCALE: 1:200

THIRD FLOOR TOTAL

WC - 26
UR - 12
LAV - 20
SHO - 12
SINK - 1
SS - 1

GRAPHIC SCALE

6

US Army Corps of Engineers

| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APPD |
|---|---|---|---|---|---|---|
| LTR | ZONE | DESCRIPTION | DATE | BY | CHKD | APPD |

DATE: 17 MARCH 2003
FILENAME:
DRAWN BY: TEC
CHECKED BY: KIM
REVIEWED BY: KIM

U.S. ARMY ENGINEERS DIVISION
PACIFIC OCEAN DIVISION
HONOLULU, HAWAII

MITSUNAGA & ASSOCIATES
747 AMA STREET, STE. 216
HONOLULU, HAWAII 96814

FY03 MCA PN 52068 WHOLE BARRACKS RENEWAL QUAD C PH3A
SCHOFIELD BARRACKS, OAHU, HAWAII

BUILDING 357 - THIRD FLOOR PLUMBING PLAN

LOCATION CODE: 9299
DRAWING NO: 721-11-28
SHEET NO:

PROJECT: QUAD C

TEC JOB NO: 02030
DATE: 28-Oct-02
STATUS: PRELIM
BY: STT

| DOMESTIC WATER PRESSURE CALCULATIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A | STATIC HEAD | 36 | FEET | X | 0.433 | PSI/FT | 15.59 | PSI |
| B | PIPING FRICTION LOSS (Max 2psi/100 ft) | 1250 | FEET | X | 0.02 | PSI/FT | 25.00 | PSI |
| C | WATER METER LOSS | | | | | | 0.00 | PSI |
| D | RPBP LOSS | | | | | | 11.00 | PSI |
| E | PRESSURE REQUIRED AT HIGHEST OUTLET | | | | | | 45.00 | PSI |
| F | REQUIRED SYSTEM PRESSURE | | | | | | 96.59 | PSI |
| G | STREET PRESSURE | | | | | | 45.00 | PSI |
| H | TOTAL (F - G) | | | | | | 51.59 | PSI |
| I | SAFETY FACTOR | | | | | | 10.00 | PSI |
| J | REQUIRED PUMP DIFFERENTIAL (BOOST) PRESSURE (H + I) | | | | | | 61.59 | PSI |

HOT WATER CALCULATIONS

| | |
|---|---|
| **PROJECT:** | FY03 MCA/BUP PN52068/69<br>WBR QUAD C, PHASE 3A<br>SCHOFIELD BARRACKS |
| **TEC JOB NO.:** | 02030 |
| **DESIGNED BY:** | THERMAL ENGINEERING CORP. |
| **PREPARED BY:** | STT |
| **DATE:** | 21-Dec-02 |

**REFERENCES**

**(1) ASHRAE SYSTEMS HANDBOOK - 1995 EDITION**

**CLASSIFICATION:** VARIES

| FIXTURE DESCRIPTION | QUANTITY | DEMAND PER FIXTURE (GPH) | TOTAL GPH |
|---|---|---|---|
| SHOWER | 218 | 30 | 6,540 |
| LAVATORY | 276 | 2 | 552 |
| KITCHEN SINK | 169 | 10 | 1,690 |
| WASHING MACHINE | 54 | 30 | 1,620 |
| SERVICE SINK | 25 | 20 | 500 |
| KITCHEN EQUIPMENT | 1 | 1000 | 1,000 |
| **TOTAL HOT WATER DEMAND:** | | | **11,902** |

**DEMAND FACTOR (DF):** 0.40
**STORAGE CAPACITY FACTOR (SCF):** 1.00

**CALCULATING PROBABLE MAXIMUM DEMAND (PMD)**

EQUATION: PMD=HW DEMAND x DF

PMD = 4,760.80 GPH

**CALCULATING STORAGE CAPACITY**

EQUATION: STORAGE=PMD x SCF

STORAGE = 4,760.80 GALLONS

**ADJUSTMENT FOR 70 F ENTERING WATER TEMPERATURE**

ADJUSTMENT FACTOR (AF): 0.82

| | | |
|---|---|---|
| **REVISED PMD = PMD * AF** | **3,903.86 GPH** | **4,099.05 mL/s** |
| **REVISED STORAGE = STORAGE * AF** | **3,903.86 GALLONS** | **14,795.61 LITERS** |

# PLUMBING EQUIPMENT SELECTION

# WATER HEATER

| | |
|---|---|
| **PROJECT:** | FY03 MCA/BUP PN52068/69 |
| | WBR QUAD C, PHASE 3A |
| | SCHOFIELD BARRACKS |
| **TEC JOB NO.:** | 02030 |
| **DESIGNED BY:** | THERMAL ENGINEERING CORP. |
| **PREPARED BY:** | STT |
| **DATE:** | 21-Dec-02 |

**ADJUSTMENT FOR INCREASING STORAGE CAPACITY & REDUCING RECOVERY**

AVAILABLE HOT WATER CAN BE CALCULATED FROM THE FOLLOWING FORMULA:

Qt = R + M x S / d

WHERE:

Qt = AVAILABLE HOT WATER, GPH (mL/s)
R = RECOVERY RATE AT THE REQUIRED TEMP, GPH (mL/s)
M = RATIO OF USABLE WATER TO STORAGE TANK CAPACITY
St = STORAGE CAPACITY OF THE HEATER TANK, GAL (L)
d = DURATION OF PEAK HOT WATER DEMAND, HOURS
Vt = REQUIRED AVAILABLE HOT WATER FOR PEAK, GAL (L)
Vt = Qt x d

CALCULATING REQUIRED RECOVERY RATE BASED ON Vt AND THE DESIRED STORAGE TANK VOLUME:

R = (Vt / d) - (M x St / d)

| SOLVING: | | | |
|---|---|---|---|
| ENTER M = | 0.75 | ASSUME 75% | |
| ENTER St = | 4,200.00 | GALLONS | 15,918.00 LITERS |
| ENTER d = | 1 | HOURS | |
| Vt = | 3,903.86 | GALLONS | 14,795.61 LITERS |
| R = | 753.86 | GPH | 791.55 mL/s |

CALCULATING REQUIRED HEAT INPUT:

Qin = 8.34 lb/gal x R x (To - Ti)

WHERE:

Qin = REQUIRED HEAT INPUT, BTUH (KW)
R = RECOVERY RATE AT THE REQUIRED TEMP, GPH (mL/s)
To = LEAVING TANK WATER TEMPERATURE, F (C)
Ti = ENTERING TANK WATER TEMPERATURE, F (C)

| SOLVING: | | | |
|---|---|---|---|
| R = | 753.86 | GPH | 791.55 mL/s |
| ENTER To = | 140.00 | F | 60.00 C |
| ENTER Ti = | 40.00 | F | 4.44 C |
| Qin = | 628,715.90 | BTUH | 184.21 KW |

# TYPE N

FINNED COPPERTUBE
INSTANTANEOUS DIRECT FIRED
HOT WATER SUPPLY BOILERS

JOB: _____

ENGINEER: _____

CONTRACTOR: _____

PREPARED BY: _____ DATE: _____

_____ MBH INPUT

MODEL _____

**INDOOR**

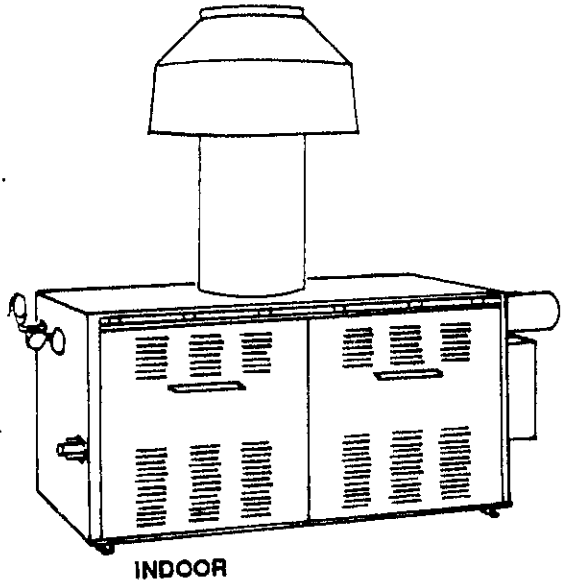
**EFFICIENT**
Thermal efficiency 82%. Highest of any atmospheric boiler available today.

**THERMAL SHOCK PROOF**
20-year warranty against thermal shock damage up to 150°F. differential. Maximum operating temperature: 230°F.

**LIGHT WEIGHT**
A floor load to 70 lbs/sq. ft. or less.

**HIGH RECOVERY**
Cuts fuel costs substantially because the standby and radiation losses normal to other boilers are eliminated.

**LOW WATER OPERATING TEMPERATURE**
Operates with water temperature as low as 105°F. without condensation.



**INDOOR**

## STANDARD EQUIPMENT

**HEAT EXCHANGER**
- ASME Inspected and Stamped 160 PSIG
- National Board Approved
- Bronze Headers
- Finned Copper Tubes
- ASME Steel Tubesheet
- Silicon O-Rings
- 125 PSIG ASME Pressure Relief Valve
- Temperature and Pressure Gauge

**CONTROL**
- 115V, 60 Hz, 1 Ph Power Supply
- 115V/24V Transformer
- 100% Pilot Shutofff/Lockout
- Pilot: Electronic, Intermittent Ignition (I.I.D.)
- High Limit Control
- On/Off Switch
- Operating Limit Control
- Flow Switch

**GAS CONTROL TRAIN**
- Manual Main Gas Shut-off Cock
- Main Gas Pressure Regulator
- Safety Shut-off Valve, Redundant
  - Control Valve
  - Modulating Firing Mode
  - AGA Design Certified. ANSI Z21.13 Requirements.

**CONSTRUCTION**
- Draft Diverter: Stack Type
- Front Controls: Enclosed
- Bolted Cabinet
- Stainless Steel Burners
- Polytuf Powder Coat Finish
- Integral Pump

## OPTIONAL EQUIPMENT

**CONSTRUCTION**
- ☐ Combustible Floor Shield

**HEAT EXCHANGER**
- ☐ Right Hand Connections
- ☐ _____

**CONTROLS**
- ☐ _____

**REGULATORY AGENCY**
- ☐ I.R.I., Industrial Risk Insurers Requirements
- ☐ F.M., Factory Mutual Insurance Requirements
- ☐ _____

Raypak

Catalog No.: 3100.22 F Replaces: 4-01-93 Effective: 9-01-94

TYPE N INSTANTANEOUS DIRECT FIRED HOT WATER SUPPLY BOILERS

MODEL_____ INDOOR

_____ MBH INPUT

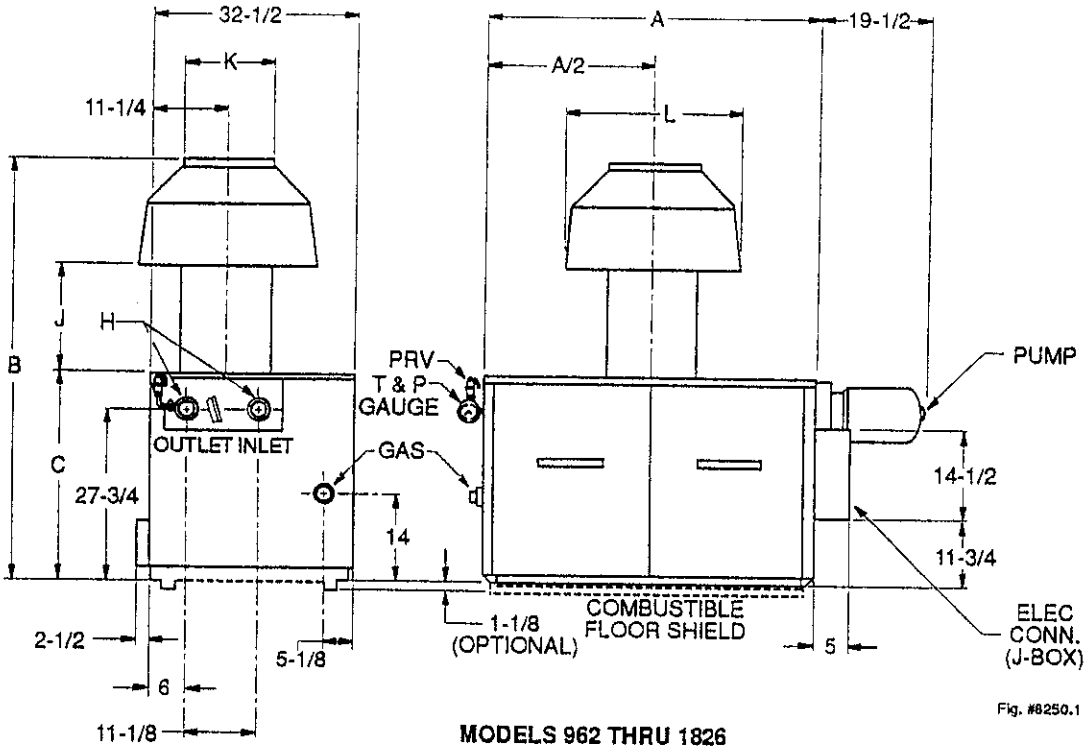



Fig. #8250.1

**MODELS 962 THRU 1826**

| Model Size | MBH Natural Gas Input | MBH Natural Gas Output | Width A | Height Overall B | Jacket Height C | Gas Conn. G | Water Conns. H | J | Flue Dia. K | L | Shipping Wt. Lbs. (Approx) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Dimensions (Inches) | | | | | | | | |
| N-962 | 961.7 | 788.6 | 52-3/8 | 68-3/4 | 33-1/2 | 1 | 2 | 18 | 14 | 28 | 760 |
| N-1125 | 1124.7 | 922.0 | 59-1/4 | 74-1/2 | 33-1/2 | 1 | 2 | 23-5/8 | 16 | 32 | 800 |
| N-1223 | 1222.5 | 1002.4 | 63-5/8 | 74-1/2 | 33-1/2 | 1-1/4 | 2 | 23-5/8 | 16 | 32 | 860 |
| N-1336 | 1336.6 | 1096.0 | 68-5/8 | 76-1/2 | 33-1/2 | 1-1/4 | 2 | 23-5/8 | 18 | 36 | 930 |
| N-1468 | 1467.0 | 1203.0 | 74-7/8 | 76-1/2 | 33-1/2 | 1-1/4 | 2 | 23-5/8 | 18 | 36 | 1000 |
| N-1631 | 1630.0 | 1336.6 | 81-1/8 | 79-1/2 | 36-1/2 | 1-1/4 | 2 | 23-5/8 | 18 | 36 | 1040 |
| N-1826 | 1825.6 | 1497.0 | 89-3/8 | 81-1/2 | 36-1/2 | 1-1/4 | 2 | 23-5/8 | 20 | 40 | 1090 |

NOTES:

Ratings shown are for elevations up to 2000 feet. Elevations over 2000 feet ratings should be reduced at the rate of 4% for each 1000 feet above sea level.

**BOILER RATE OF FLOW AND PRESSURE DROP**

| Model Size | 20°ΔT GPM | 20°ΔT ΔP FT | 30° ΔT GPM | 30° ΔT ΔP FT | 40° ΔT GPM | 40° ΔT ΔP FT |
|---|---|---|---|---|---|---|
| N-962 | 79 | 8.5 | 53 | 3.5 | 39 | 2.1 |
| N-1125 | 90* | 12.0 | 61 | 5.5 | 46 | 3.1 |
| N-1223 | 90* | 12.5 | 67 | 7.0 | 50 | 3.9 |
| N-1336 | 90* | 13.1 | 73 | 8.6 | 55 | 4.9 |
| N-1468 | 90* | 14.0 | 80 | 11.0 | 60 | 6.2 |
| N-1631 | 90* | 14.6 | 89 | 14.3 | 67 | 8.0 |
| N-1826 | 90* | 15.2 | 90* | 15.2 | 75 | 10.6 |

* GPM Flow rates limited by maximum acceptable velocity through heat exchanger tubes.

**BOILER RECOVERY RATES**

| Model No. | 10° | 20° | 30° | 40° | 50° | 60° | 80° | 100° |
|---|---|---|---|---|---|---|---|---|
| | TEMPERATURE RISE IN DEGREES F | | | | | | | |
| | Gallons Per Hour | | | | | | | |
| N-962 | 9467 | 4733 | 3156 | 2367 | 1893 | 1578 | 1183 | 947 |
| N-1125 | 11071 | 5536 | 3690 | 2762 | 2214 | 1845 | 1384 | 1107 |
| N-1223 | 12034 | 6017 | 4011 | 3009 | 2407 | 2006 | 1504 | 1203 |
| N-1336 | 13157 | 6579 | 4386 | 3289 | 2631 | 2193 | 1645 | 1316 |
| N-1468 | 14441 | 7221 | 4814 | 3610 | 2888 | 2407 | 1805 | 1444 |
| N-1631 | 16046 | 8023 | 5349 | 4011 | 3209 | 2674 | 2006 | 1605 |
| N-1826 | 17971 | 8986 | 5990 | 4493 | 3594 | 2995 | 2246 | 1797 |

Raypak, Inc., 31111 Agoura Road, Westlake Village, CA 91361-4699 (818) 889-1500 Fax (818) 889-4522

Litho in U.S.A.

# DOMESTIC WATER BOOSTER PUMP

PROJECT: FY03 MCA/BUP PN52068/69
WBR QUAD C, PHASE 3A
SCHOFIELD BARRACKS
TEC JOB NO: 02030
DATE: 21-Dec-02
STATUS: PRELIM
BY: STT

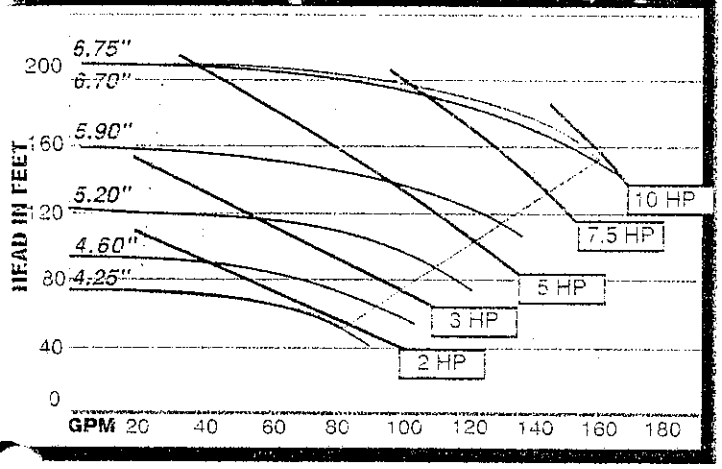
| DOMESTIC WATER PRESSURE CALCULATIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A | STATIC HEAD | 36 | FEET | X | 0.433 | PSI/FT | 15.59 | PSI |
| B | PIPING FRICTION LOSS (Max 2psi/100 ft) | 1250 | FEET | X | 0.02 | PSI/FT | 25.00 | PSI |
| C | WATER METER LOSS | | | | | | 0.00 | PSI |
| D | RPBP LOSS | | | | | | 11.00 | PSI |
| E | PRESSURE REQUIRED AT HIGHEST OUTLET | | | | | | 45.00 | PSI |
| F | REQUIRED SYSTEM PRESSURE | | | | | | 96.59 | PSI |
| G | STREET PRESSURE | | | | | | 45.00 | PSI |
| H | TOTAL (F - G) | | | | | | 51.59 | PSI |
| I | SAFETY FACTOR | | | | | | 10.00 | PSI |
| J | REQUIRED PUMP DIFFERENTIAL (BOOST) PRESSURE (H + I) | | | | | | 61.59 | PSI |

IronHeart

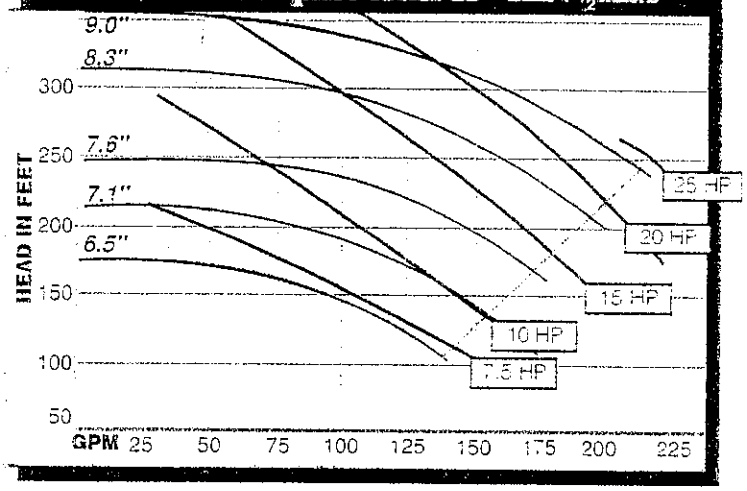
# 3500 rpm Pump Curves

| HEADER SIZE | 3" | 4" | 6" |
|---|---|---|---|
| FLOW-GPM | 300 | 600 | 1000 |
| PRV SIZE | | 2" | 2 1/2" |
| FLOW-GPM | | 150 | 250 |

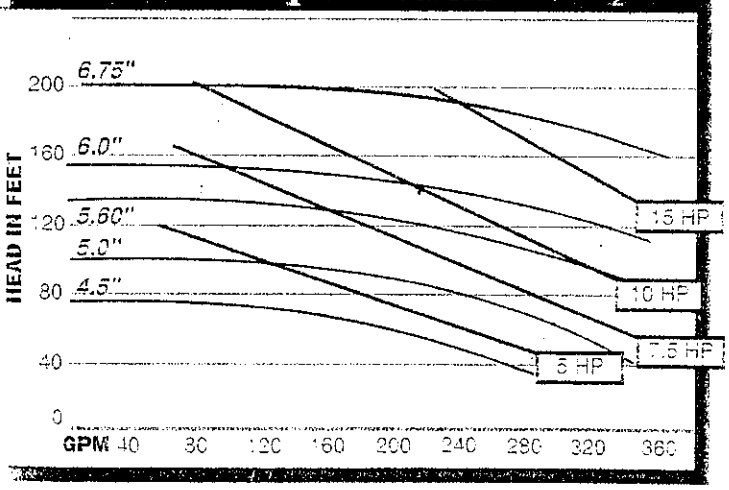
## IronHeart 3500 rpm Model 5A SIZE 1 1/4x1 1/2x7



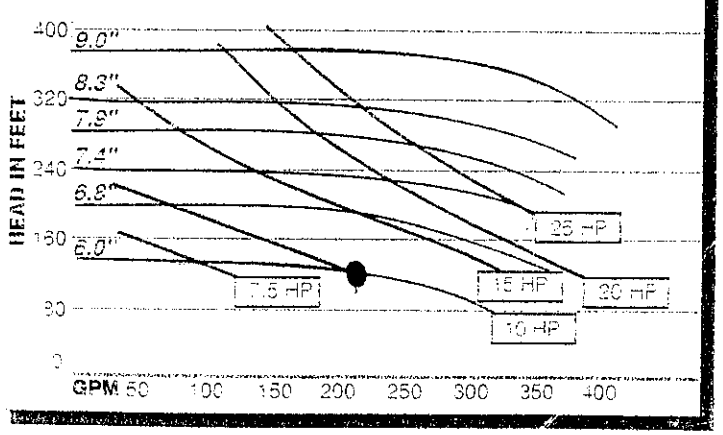

## IronHeart 3500 rpm Model 5F SIZE 1 1/2x2x9




## IronHeart 3500 rpm Model 5H SIZE 2x2 1/2x7




## IronHeart 3500 rpm Model 5K SIZE 2x2 1/2x9



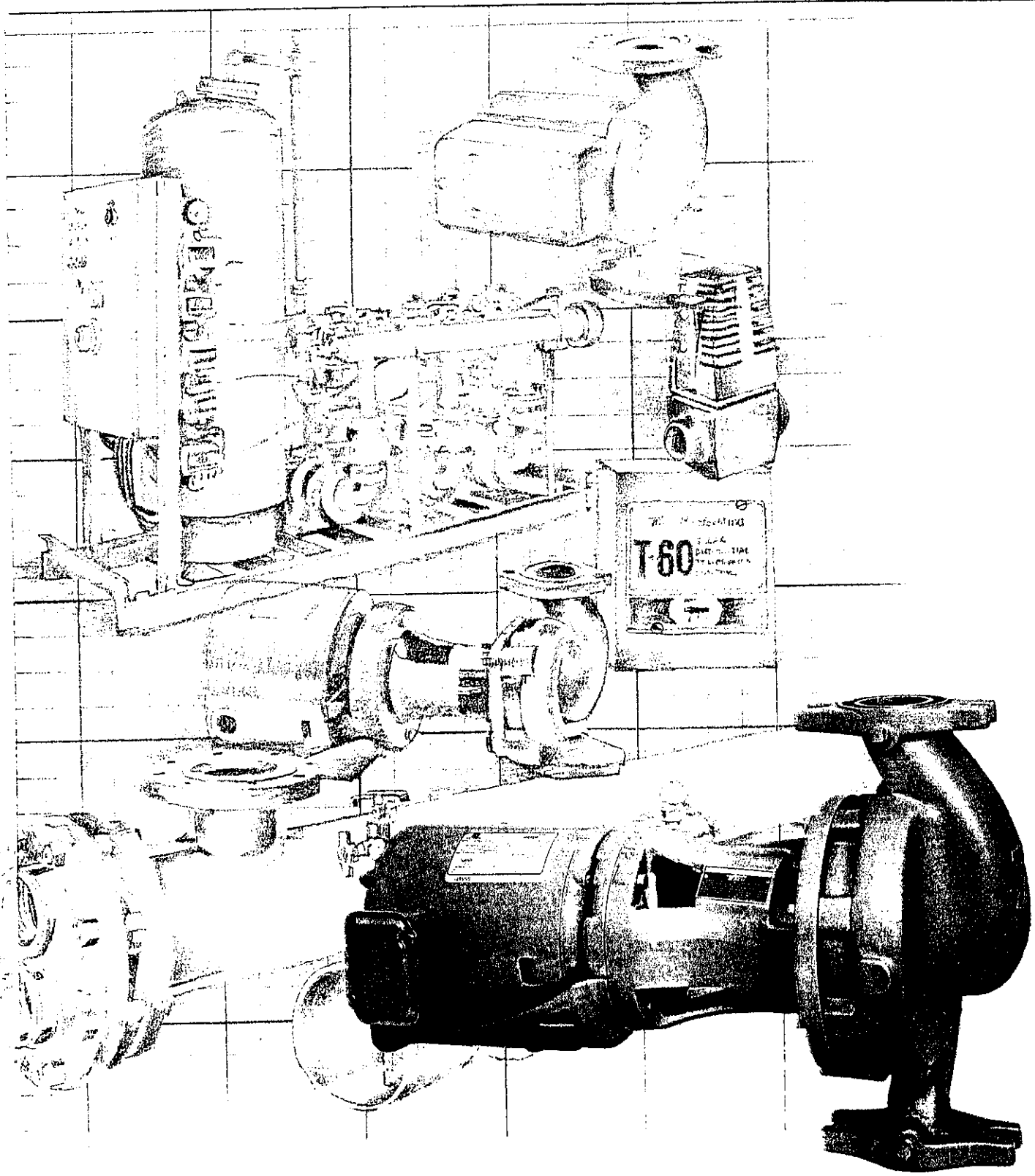
# HOT WATER CIRCULATING PUMP

PROJECT: FY03 MCA/BUP PN52068/69
WBR QUAD C, PHASE 3A
SCHOFIELD BARRACKS
TEC JOB NO: 02030
DATE: 21-Dec-02
STATUS: PRELIM
BY: STT

| HOT WATER RETURN PUMP CALCULATIONS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| A | STATIC HEAD | 0 | FEET | X | 0.433 | PSI/FT | 0.00 | PSI |
| B | PIPING FRICTION LOSS (Max 2psi/100 ft) | 1250 | FEET | X | 0.02 | PSI/FT | 25.00 | PSI |
| C | WATER METER LOSS | | | | | | 0.00 | PSI |
| D | RPBP LOSS | | | | | | 0.00 | PSI |
| E | PRESSURE REQUIRED AT HIGHEST OUTLET | | | | | | 0.00 | PSI |
| F | REQUIRED SYSTEM PRESSURE | | | | | | 25.00 | PSI |
| G | STREET PRESSURE | | | | | | 0.00 | PSI |
| H | TOTAL (F - G) | | | | | | 25.00 | PSI |
| I | SAFETY FACTOR | | | | | | 0.00 | PSI |
| J | REQUIRED PUMP DIFFERENTIAL (BOOST) PRESSURE (H + I) | | | | | | 25.00 | PSI |

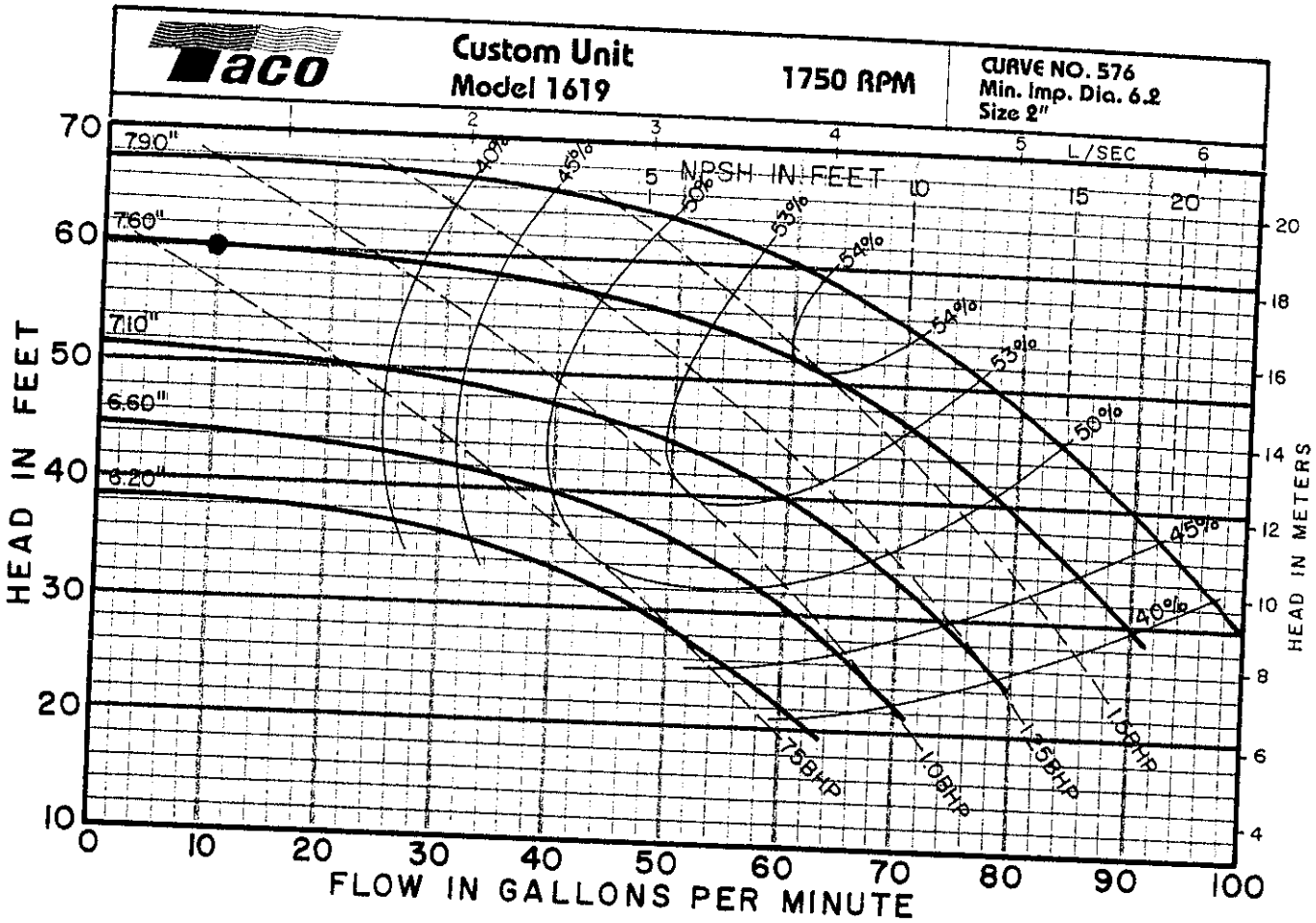
Taco

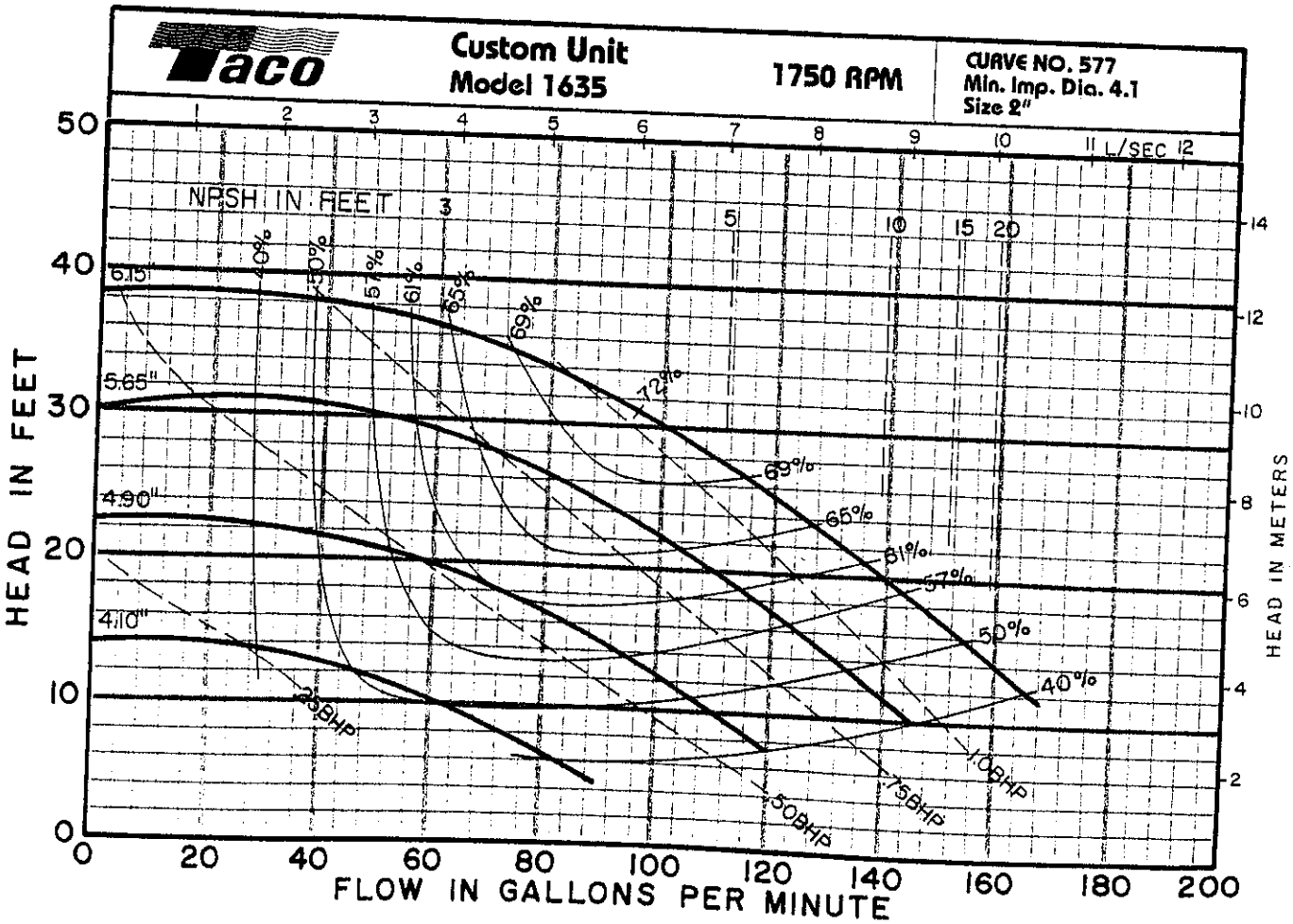
COMPARE. YOU'LL TAKE TACO.




# "1600" SERIES IN-LINE PUMP

CATALOG 300-1.1


Taco
Custom Unit
Model 1619
1750 RPM
CURVE NO. 576
Min. Imp. Dia. 6.2
Size 2"
L/SEC
NPSH IN FEET
7.90"
7.60"
7.10"
6.60"
6.20"
40%
45%
50%
53%
54%
54%
53%
50%
45%
40%
.75BHP
1.0BHP
1.25BHP
1.5BHP
HEAD IN FEET
HEAD IN METERS
FLOW IN GALLONS PER MINUTE


Taco
Custom Unit
Model 1635
1750 RPM
CURVE NO. 577
Min. Imp. Dia. 4.1
Size 2"
L/SEC
NPSH IN FEET
6.15"
5.65"
4.90"
4.10"
40%
50%
57%
61%
65%
69%
72%
69%
65%
61%
57%
50%
40%
.25BHP
.50BHP
.75BHP
1.0BHP
HEAD IN FEET
HEAD IN METERS
FLOW IN GALLONS PER MINUTE

# HOT WATER STORAGE TANK

| | |
|---|---|
| **PROJECT:** | FY03 MCA/BUP PN52068/69<br>WBR QUAD C, PHASE 3A<br>SCHOFIELD BARRACKS |
| **TEC JOB NO.:** | 02030 |
| **DESIGNED BY:** | THERMAL ENGINEERING CORP. |
| **PREPARED BY:** | STT |
| **DATE:** | 17-Dec-02 |

**ADJUSTMENT FOR INCREASING STORAGE CAPACITY & REDUCING RECOVERY**

AVAILABLE HOT WATER CAN BE CALCULATED FROM THE FOLLOWING FORMULA

Qt = R + M x S / d

WHERE:

Qt = AVAILABLE HOT WATER, GPH (mL/s)
R = RECOVERY RATE AT THE REQUIRED TEMP, GPH (mL/s)
M = RATIO OF USABLE WATER TO STORAGE TANK CAPACITY
St = STORAGE CAPACITY OF THE HEATER TANK, GAL (L)
d = DURATION OF PEAK HOT WATER DEMAND, HOURS
Vt = REQUIRED AVAILABLE HOT WATER FOR PEAK, GAL (L)
Vt = Qt x d

CALCULATING REQUIRED RECOVERY RATE BASED ON Vt AND THE DESIRED STORAGE TANK VOLUME:

R = (Vt / d) - (M x St / d)

SOLVING:

| | | |
|---|---|---|
| ENTER M = | 0.75 ASSUME 75% | |
| ENTER St = | 2,880.00 GALLONS | 10,915.20 LITERS |
| ENTER d = | 1 HOURS | |
| Vt = | 3,808.64 GALLONS | 14,434.75 LITERS |
| R = | 1,648.64 GPH | 1,731.07 mL/s |

CALCULATING REQUIRED HEAT INPUT:

Qin = 8.34 lb/gal x R x (To - Ti)

WHERE:

Qin = REQUIRED HEAT INPUT, BTUH (KW)
R = RECOVERY RATE AT THE REQUIRED TEMP, GPH (mL/s)
To = LEAVING TANK WATER TEMPERATURE, F (C)
Ti = ENTERING TANK WATER TEMPERATURE, F (C)

SOLVING:

| | | |
|---|---|---|
| R = | 1,648.64 GPH | 1,731.07 mL/s |
| ENTER To = | 140.00 F | 60.00 C |
| ENTER Ti = | 40.00 F | 4.44 C |
| Qin = | 1,374,965.76 BTUH | 402.86 KW |

*Welcome to the Hanson Tank web site on Friday 20 December*

*Your One-Stop Source for A.S.M.E. pressure vessels*

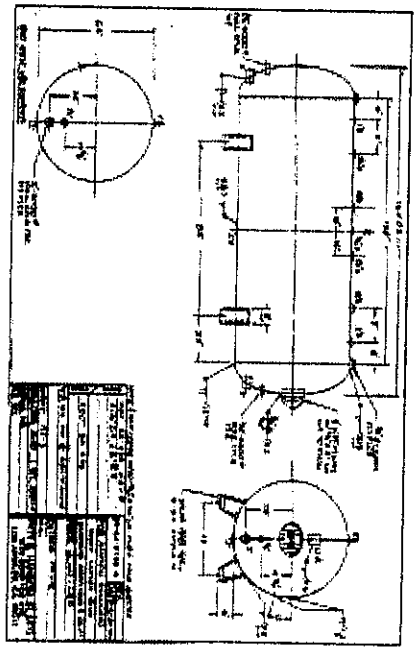
Phone: 800-421-9395 Fax: 213-747-7724 email:info@hansontank.com

*Water Tanks - Asme High Pressure Water Tank - Hanson Tank*
*U.S. manufacturer of carbon steel and stainless steel pressure vessels built to the ASME Boiler and Pressure Vessel Code*

| | | |
|---|---|---|
| GS-64-2100-H | 2100 gallon glass lined Horizontal Water Tank, 125psig, ASME | $11,16 |

REQUEST A QUOTE FOR A CUSTOM TANK

Click on drawing to enlarge for printing



BACK TO BUILT TO ORDER TANKS

## WATER TANKS
## TECHNICAL SPECIFICATIONS

These Hanson lined potable hot water storage tanks are built a tested in accordance with the A.S.M.E. Boiler and Pressu Vessel Code Section IV Division II for potable hot water stora tanks and bear the "HLW" stamp, and serial number, nation board number as required. A copy of the A.S.M.E. data she HLW-6, signed by an A.S.M.E. authorized inspector, will be se with the invoice if requested at time of order.

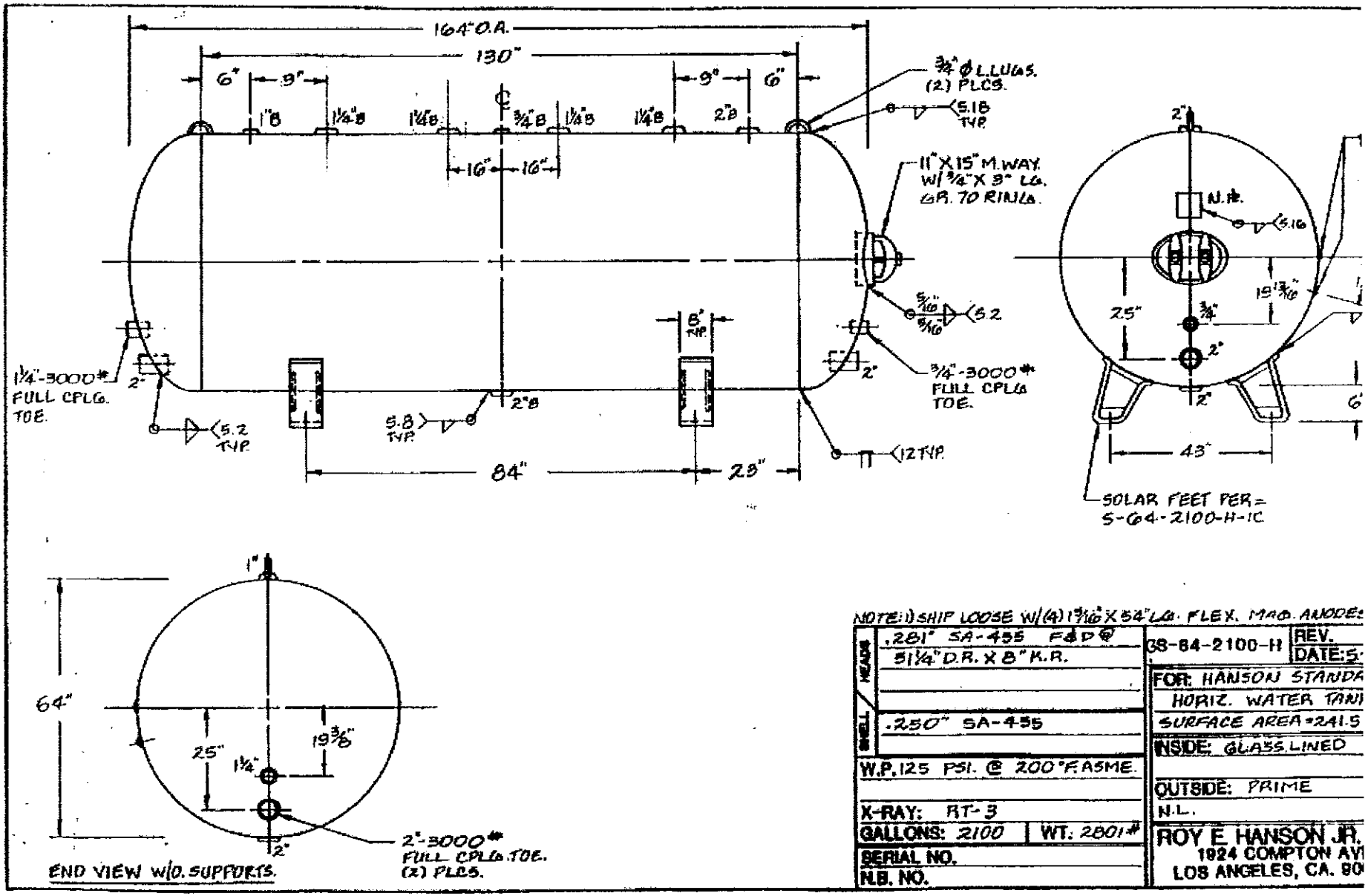
Standard exterior paint system is power buff to SSPC-SP3 pl one coat 2/3 MIL DFT rust resistant primer. Standard interi finish is fired porcelain enamel, aka "GLASS".

All tappings and flange openings are plugged and covered befo shipment. Manway covers are installed for shipping only, a must be adjusted and tightened before the tank is pressurized.

Sacrificial magnesium alloy anodes are shipped loose with glass lined tanks for installation at the jobsite. These must checked periodically in service and replaced if necessary protect the tank lining.

The A.S.M.E. name plate and the supplied lift lugs are installed allow clearance for tank insulation, which is available at ext cost.

Water storage tanks are guaranteed free from defects in mater and workmanship for one year from the date of shipment, FC our factory. Full limited warranty terms are available on request.


164" O.A.
130"
6"
9"
1"B
1¼"B
1¼"B
¾"B
1¼"B
1¼"B
2"B
9"
6"
16"
16"
¾" ϕ L.LUGS. (2) PLCS.
5.1B TYP.
11" X 15" M.WAY. W/ ¾" X 3" LG. GR. 70 RINGS.
5/16
5/16
5.2
8" TYP.
1¼"-3000# FULL CPLG. TOE.
2"
5.2 TYP.
5.8 TYP.
2"B
2"
¾"-3000# FULL CPLG TOE.
12 TYP.
84"
23"
2"
N.P.
5.1G
19 13/16"
25"
¾"
2"
2"
6"
43"
SOLAR FEET PER = S-G4-2100-H-1C
1"
64"
25"
1¼"
19⅜"
2"
2"-3000# FULL CPLG. TOE. (2) PLCS.
END VIEW W/O. SUPPORTS.
NOTE: 1) SHIP LOOSE W/ (4) 1 5/16" X 54" LG. FLEX. MAG. ANODES
HEADS .281" SA-455 F&D @ 51¼" D.R. X 8" K.R.
SHELL .250" SA-455
W.P. 125 PSI. @ 200°F ASME.
X-RAY: RT-3
GALLONS: 2100
WT: 2801#
SERIAL NO.
N.B. NO.
GS-64-2100-H
REV.
DATE: 5
FOR: HANSON STANDA
HORIZ. WATER TANK
SURFACE AREA = 241.5
INSIDE: GLASS LINED
OUTSIDE: PRIME
N.L.
ROY E. HANSON JR.
1924 COMPTON AV
LOS ANGELES, CA. 90

# GREASE INTERCEPTOR

PROJECT: QUAD C

PROJECT NO.: 02030
DATE: 28-Oct-02
BY: STT
STATUS: Preliminary

**DISHWASHING GREASE INTERCEPTOR SIZING FORMULA (UPC-APPENDIX H)**

M x F x T x S = Interceptor Size (Liquid Capacity in Gallons)

Where: M = Meals served at peak hour

F = Waste flow rate
- 6 Gallon flow (with dishwashing machine)
- 5 Gallon flow (without dishwashing machine)
- 2 Gallon flow (single service kitchen)
- 1 Gallon flow (food waste disposer)

T = Retention time
- 2.5 Hours (commercial kitchen waste, dishwasher)
- 1.5 Hours (single service kitchen, single service)

S = Storage factor
- 1 Fully equipped commercial kitchen (8-hr operation)
- 2 Fully equipped commercial kitchen (16-hr operation)
- 3 Fully equipped commercial kitchen (24-hr operation)
- 1.5 Single service kitchen

| | | | |
|---|---|---|---|
| Therefore | | 150 | Meals served at peak hour[1] |
| | x | 6 | Waste flow rate |
| | x | 2.5 | Retention time |
| | x | 2 | Storage factor |
| | | 4,500 | Interceptor Size (Liquid Capacity in Gallons) |

Design Selection: 5000 gallon pre-cast concrete grease interceptor

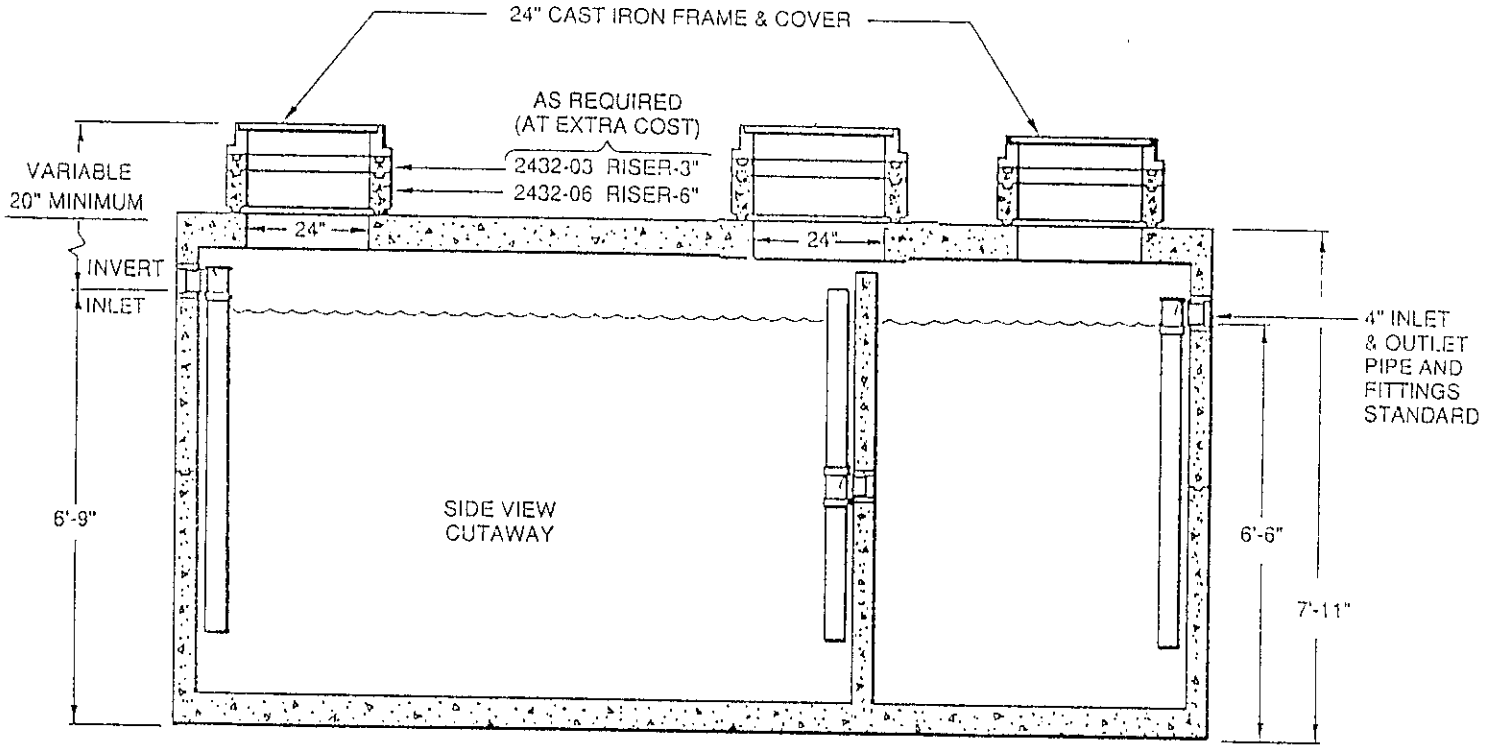
[1]Meal Count is Based on the Following:

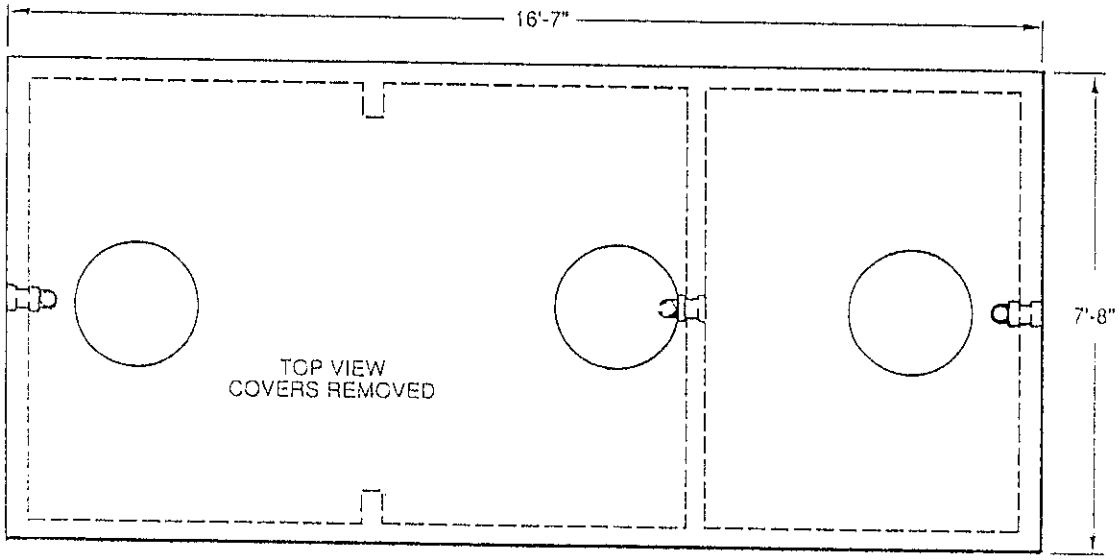
Peak Meals Per Meal Period = 300

Allocate 50% of Meals to Dishwashing GT and 50% to Kitchen GT
Meals served per GT = 300 x 0.5 = 150

# 5000 GALLON GREASE INTERCEPTOR

## MODEL 5000EE

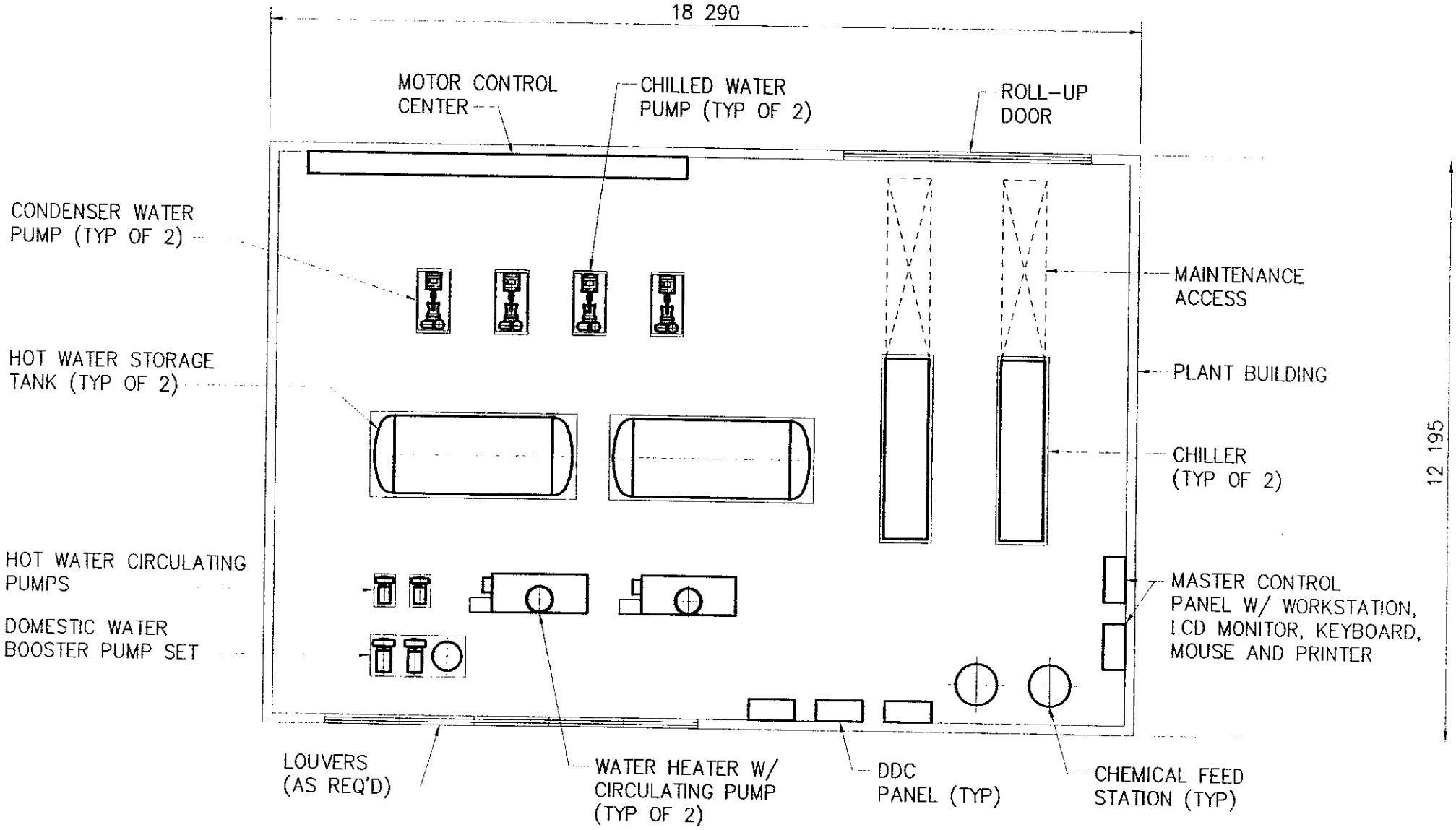



LIQUID CAPACITY: 5000 GALLONS
BOX DESIGN LOAD: H-20 TRAFFIC FROM 1' TO 5' COVER. FOR COMPLETE DESIGN INFORMATION, Consult Quality Precast Products LLC

11/89

# CENTRAL MECHANICAL PLANT




# CENTRAL MECHANICAL PLANT

SCALE: NONE

ATTACHMENT 5

# FIRE PROTECTION DESIGN ANALYSIS AND CALCULATIONS

A. Design References

1. MIL-HDBK-1008C, Fire Protection for Facilities, (10 June 1997)
2. TI 800-01, Design Criteria, 20 July 1998
3. UFC 1-200-01, Design: General Building Requirements, 31 July 2002
4. UFC 4-101-01 DoD Minimum Antiterrorism Standards For Buildings, 31 July 2002
5. International Building Code (IBC), 2000
6. ASME A17.1 Safety Code For Elevators and Escalators, 2000
7. American with Disabilities Act Accessibility Guidelines (ADAAG), 1998
8. National Fire Codes, National Fire Protection Association Standards including:

| | |
|---|---|
| NFPA 10 | Portable Fire Extinguishers, 1998 |
| NFPA 13 | Sprinkler Systems, 1999 |
| NFPA 17A | Wet Chemical Extinguishing Systems, 1998 |
| NFPA 20 | Installation of Stationary Pumps for Fire Protection, 1999 |
| NFPA 24 | Private Fire Service Mains and Their Appurtenances, 1995 |
| NFPA 70 | National Electrical Code, 1999 |
| NFPA 72 | National Fire Alarm Code, 1999 |
| NFPA 96 | Ventilation Control and Fire Protection of Commercial Cooking Operations, 2001 |
| NFPA 101 | Life Safety Code, 2000 |

B. General

Quad C is a group of four, three-story buildings. Building 355 contains a gymnasium, storage areas, and administrative areas; Buildings 356 and 358 contain barracks; and Building 357 contains a dining facility, storage areas, and administrative areas. The total area of Building 355 is approximately 6,160sqm, Buildings 356 and 358 are approximately 6,808sqm each, and Building 357 is approximately 6,910sqm. The project is to completely renovate these four buildings to current building and life safety codes, including new underground utilities, fire suppression systems and fire alarm systems.

C. Construction and Occupancy

All four buildings are Type II-A structures. All structural components, floor construction, bearing walls, and the roof shall be constructed of one-hour fire resistive construction.

The IBC occupancy classification for the quad is as follows. Buildings 356 and 358 are both a Group R-2 occupancy. Building 355 is a mixed occupancy with Group A-3, Group B, and Group S-1 uses. Building 357 is also a mixed occupancy with Group A-2, Group A-3, Group B, and Group S-1 uses.

The NFPA 101 classification for the quad is: Buildings 356 and 358 are both New Apartment Building occupancies. Building 355 is a mixed occupancy with New Assembly,

New Business, and Storage occupancies. Building 357 is also mixed a occupancy with New Assembly, New Business, and Storage occupancies.

D. Allowable Floor Areas and Height

The tabular floor area for a Group A-2, or A-3 occupancy of Type II-A construction is 1,440 square meters. The tabular floor area for a Group B Occupancy of Type II-A construction is 3,484 square meters. The tabular floor area for a Group R-2 Occupancy of Type II-A construction occupancy is 2,230 square meters. The tabular floor area for a Group S-1 Occupancy of Type II-A construction is 2,415.5 square meters.

Building frontage on four sides of the building and fire sprinklers are used to increase the tabular floor area and building height. Since Buildings 355 and 357 contain mixed occupancy uses, the non-separated use option of Section 302.3.2 will be utilized in calculating the allowable floor area for these two buildings. Buildings 356 and 358 will also use the non-separated use option of Section 302.3.2 to determine the allowable area for the buildings.

The A-2 Occupancy has the most restrictive tabular area requirements for Buildings 355 and 357 and is used to calculate the allowable area modifications. Building 356 and 358 will be calculated using the tabular floor area of 2,230 square meters.

Allowable Area Modifications:

| | |
|---|---|
| 200% increase for fire sprinklers | (IBC section 506.3) |
| Percentage increase for frontage | (IBC section 506.2 as calculated below using Equation 5-2) |
| $I_f = 100[(F/P) - 0.25](W/9.14)$ | (Equation 5-2) |

Where:

$I_f$ = Area increase due to frontage (percent)
F = Building perimeter which fronts a public way or open space having 6.1 meters open minimum width (259 meters)
P = Perimeter of entire building (259 meters)
W = Minimum width of public way or open space

Total Allowable Area:

$A_a = A_t + (A_t\ I_f / 100) + (A_t\ I_s / 100)$

Where:

$A_a$ = Allowable area per floor
$A_t$ = Tabular floor area
$I_f$ = Area increase due to frontage (percent)
$I_s$ = Area increase due to sprinkler protection (percent)

Building 355

$A_a$ = 1,440 + (1,440 x 75/100) + (1,440 x 200/100)

$A_a$ = 5,400 square meters

$A_a$ can be multiplied by three to determine the maximum floor area. The maximum floor area for Building 355 is 16,200 square meters.

Using the same method, the allowable areas and maximum floor areas of the remaining buildings are:

Building 357 (P = 339 meters, F = 303 meters, W = 3 meters)

$I_f$ = 21.1

$A_a$ = 1,440 + (1,440 x 21.1/100) + (1,440 x 200/100)

$A_a$ = 4,623.8 square meters

The maximum floor area for Building 357 is = $A_a$ x 3 = 13,871.4 square meters

Building 356 and 358 (P = 303 meters, F = 303 meters, W=9.14 meters)

$I_f$ = 75

$A_a$ = 2,230 + (2,230 x 75/100) + (2,230 x 200/100)

$A_a$ = 8362.5 square meters

The maximum floor area for Buildings 356 and 358 is = $A_a$ x 3 = 25,087.5 square meters. All buildings are within the allowable area requirements of the IBC.

Allowable Height Modifications

The maximum building height for A-2, A-3, B, R-2 and S-1 occupancies in a Type IIA building is 19.8 meters per IBC Table 503. The building height is permitted an increase of one story and 6.1 meters due to the installation of automatic fire sprinklers per IBC section 504. The maximum number of stories permitted is 4 stories for the A-2 and A-3 occupancies, 6 stories for the B occupancies, and 5 stories for the R-2 and S-1

occupancies. All of the buildings are within the allowable height requirements of the IBC.

E. Separation of Structures

The primary exposures of the buildings in the quad are:

Building 355

North Exposure: The north side of the building is Waianae Avenue. The nearest structures are Building 301 and 314 located 38 meters away.

South Exposure: The south side of the building is the open courtyard of the quad. The nearest structures are the additions to Buildings 356 and 358 located 31 meters away.

East Exposure: The east side of the building is a one of the controlled access points into the quad, and beyond that is the fire pump house and chiller enclosure. The nearest structure is the fire pump house located 41 meters away.

West Exposure: The west side of the building is Flagler Road. Also located to the west is a parking lot for the building. The nearest structure is Building 361 located 38 meters away.

Building 356

North Exposure: The north side of the building is Waianae Avenue. The nearest structure is Building 315 located 70 meters away.

South Exposure: The south side of the building is Foote Avenue. The nearest structure is Building 360 located 44 meters away.

East Exposure: The east side of the building is the open courtyard of the quad. The nearest structure is the addition to Buildings 357 located 20 meters away.

West Exposure: The west side of the building is Flagler Road. Also located to the west is a parking lot for the building. The nearest structure is Building 361 located 14 meters away.

Building 357

North Exposure: The north side of the building is the open courtyard of the quad. The nearest structures are the additions to Buildings 357. These additions are located 3 meters away.

South Exposure: The south side of the building is Foote Avenue. The nearest structure is Building 360 located 22 meters away.

East Exposure: The east side of the building is the primary parking lot for the building. The nearest structure is Building 256 located 120 meters away.

West Exposure: The west side of the building is Flagler Road. Also located to the west is a parking lot for the building. The nearest structure is Building 450 located 195 meters away.

Building 358

North Exposure: The north side of the building is Waianae Avenue. The nearest structure is Building 300 located 69 meters away.

South Exposure: The south side of the building is Foote Avenue. The nearest structure is Building 372 located 122 meters away.

East Exposure: The east side of the building is the primary parking lot for the building. The nearest structure is Building 256 located 96 meters away.

West Exposure: The west side of the building is the open courtyard of the quad. The nearest structure is the additions to Buildings 357 located 21 meters away.

F. Exterior Wall and Opening Protection

Per MIL-HDBK-1008C, fire resistant ratings of exterior walls shall be by the building code. Per IBC, Table 602, for Type II-A construction for all occupancies listed in Section C, the fire resistance of exteriors walls shall be of one-hour fire resistive construction if the separation distance is $\geq$ 1.5 meters, but < 9.14 meters. If the separation distance is greater than 9.14 meters, there is no fire resistance construction requirement.

There are three walls on the additions to Building 357 that create an exposure to the main building on the first floor. The south wall of the men's bathroom, the south wall of the large electrical room that opens towards the dining area, and the south wall of the large electrical room and compactor room that open towards the can washing area are within the 1.5 to 9.14 meter distance. These walls create an exposure, and shall be of one-hour fire resistive construction, and the openings in these walls shall be protected by 3/4-hour rated assemblies. The remaining exposures for the quad exceed 9.14 meters and therefore do not require any fire resistance rating.

Cornices, and eave overhangs shall be of noncombustible construction.

G. Fire Walls, Fire Partitions, and Smoke Partitions

Though the allowable area calculations were based on a non-separated use, barriers are still required by other codes and standards. Protection from hazardous areas as defined by NFPA 101, Chapters 12, 30 and 38 is required. In a New Assembly or New Apartment Building occupancies, laundries, and maintenance shops, including woodworking and painting areas shall be separated from the remainder of the building by one-hour fire resistive construction and sprinkler systems as specified in NFPA 101 Section 8.4. Since the structures shall be fully sprinklered, the corridors of Buildings 356 and 358 that provide exit access shall be of minimum 1/2-hour fire resistive construction in accordance with NFPA 101, Chapter 30 New Apartment Building occupancies.

All vertical openings through the floors of the building shall be enclosed within shafts of one-hour rated fire resistive construction when penetrating three floors or less. The elevator machine room is connected to the elevator shaft. All openings shall be sealed to meet the one-hour fire resistance rating, or the machine room shall be of one-hour fire resistive construction in accordance with ASME A17-1.

Floor to floor smoke barriers shall be in accordance with NFPA 101, Chapter 8.

H. Means of Egress

The means of egress shall be in accordance with NFPA 101 including Chapters 12, 30, 38, and 42, and ADAAG, and in no case shall there be less than two means of egress from any structure. Where there is a mixed occupancy, the criteria from the most restrictive occupancy shall apply. The hazard classification per NFPA 101 is ordinary hazard for all four buildings. NFPA 101 requires no designated area of refuge since the buildings are fully sprinklered, however the New Assembly occupancies still require two accessible rooms for egress requirements. Only able-bodied military personnel inhabit Buildings 356 and 358 and therefore the accessibility requirements do not apply to these buildings. The arms vaults are also exempt from accessibility requirements.

I. Fire Sprinkler Protection Criteria

All four buildings and the new fire pump building will require the installation of new sprinkler systems in accordance with MIL-HDBK-1008C, NFPA 13, and NFPA 101.

The sprinkler system design for the first floor of Building 355 and the kitchen area of Building 357 will be a design density of 6.11 lpm/sm over 279 square meters with quick response sprinklers and a hose allowance of 1,892.5 lpm. The sprinkler system for the elevator pit and elevator machine room in Building 355 will be a design density of 8.15 lpm/sm over the entire area with standard response intermediate temperature sprinklers and a hose allowance of 1,892.5 lpm. Any room designated storage; supply, or mechanical shall be designed to a design density of 8.15 lpm/sm. The storage rooms shall not exceed a storage height of 12 feet.

The sprinkler system design for the first floor dining area of Building 357, and second and third floors of Buildings 355 and 357 will be a design density of 4.07 lpm/sm over 279 square meters with quick response sprinklers and a hose allowance of 946.3 lpm. Any room designated storage; supply, or mechanical shall be designed to a design density of 8.15 lpm/sm. The storage rooms shall not exceed a storage height of 12 feet.

The sprinkler system design for Buildings 356 and 358 will be a design density of 4.07 lpm/sm over 279 square meters with quick response sprinklers and a hose allowance of 946.3 lpm. Any room designated storage; supply, or mechanical shall be designed to a design density of 8.15 lpm/sm. The storage rooms shall not exceed a storage height of 12 feet.

The sprinkler system for the new fire pump building will be a design density of 8.15 lpm/sm over the entire area with standard response intermediate temperature sprinklers and a hose allowance of 1,892.5 lpm.

J. Fire Pump

The water distribution system is unable to provide adequate pressure for the proper operation of the fire sprinkler systems. A fire pump, installed in accordance with NFPA 20, is necessary to boost the water supply pressure for the fire sprinkler systems. A diesel fire pump rated at 1,893 lpm @ 655 kPa (500 gpm @ 95 psi) will be required to provide the minimum sprinkler system demand. The new fire pump is located in a new standalone structure between Buildings 355 and 356.

K. Water Supply

A new 200 mm underground main will be installed around the interior perimeter of Quad C in accordance with NFPA 24 to supply the fire sprinkler systems for the four buildings. The new 200 mm supply main connects to an existing 450 mm main installed along Waianae Avenue. Water flow tests were performed at fire hydrants FH-C-1 and FH-C-2 on Waianae Avenue on 12 April 2002. Static and residual pressures were measured using fire hydrant FH-C-1. The results of the test are:

| | | |
|---|---|---|
| Static Pressure: | 324.1 kPa | (47 psi) |
| Residual Pressure: | 268.9 kPa | (39 psi) |
| Flow: | 2,878.2 lpm | (760.5 gpm) |
| Flow at 137.9 kPa (20 psi): | 5,551.5 lpm | (1,466.6 gpm) |

L. Fire Alarm System

A new multiplex/addressable programmable analog fire alarm system will be required for all four buildings. Initiation devices consist of manual fire alarm pull stations, duct smoke detectors, smoke detectors, and heat detectors. Smoke detectors will be required in the

elevator machine room, in each elevator lobby, and by the fire alarm control panels. Heat detectors may be used in lieu of smoke detectors by the fire alarm control panels when conditions warrant. Smoke detectors with sounder bases will be required in all dwelling units. Heat detectors will be required in the elevator machine room and in the elevator pit adjacent to each sprinkler head, but will be used only for elevator recall (see Attachment #1). The fire alarm system will supervise detection devices, manual fire alarm pull stations, audiovisual devices, water flow switches, tamper switches, fire pump status conditions, and the rangehood suppression system alarm contacts. Audiovisual notification devices will be required in the corridors and common use areas of the buildings. Attachment #1 contains the fire alarm matrix that shall be included in the design of the fire alarm system.

M. Range Top Fire Suppression Systems

The new cook tops located in the dwelling units will not be required to be protected by a range top suppression system in accordance with MIL-HDBK-1008C.

N. Rangehood Fire Suppression System

The rangehoods in the kitchen in Building 357 are required to be protected by a wet chemical fire suppression system in accordance with NFPA 17A, NFPA 96 and MIL-HDBK-1008C.

O. Emergency Lights and Exit Signs

New emergency and exit lighting is required throughout the buildings to provide lighting in event of primary power loss and to clearly indicate the means of egress. The emergency and exit lighting shall comply with NFPA 70 and NFPA 101.

P. Portable Fire Extinguishers

Portable fire extinguishers are required per MIL-HDBK-1008C. 4A:60B:C multi-purpose dry chemical portable fire extinguishers are recommended. The size and placement of fire extinguisher cabinets will be required to comply with NFPA 10.

Q. Antiterrorism/Force Protection

Implementation of UFC 4-101-01 DoD Minimum Antiterrorism Standards For Buildings, 31 July 2002 to bring an entire building into compliance is mandatory for all DoD building renovations, modifications, repairs, and restorations where those costs exceed 50% of the replacement cost of the building. Where the 50% threshold is not met, compliance with the standard is recommended.

Though the cost of the renovation of these buildings is not expected to be greater than 50% of the replacement value, UFC 4-101-01 will be implemented in this project.

The buildings are considered inhabited structures with a personnel density greater than 1 occupant per 40 square meters. The total occupant load exceeds 50 people per structure making them primary gathering buildings. With the implementation of UFC 4-101-01, a mass notification system is required for each building.

**FIRE ALARM SEQUENCE OF OPERATIONS MATRIX**

Edited by: US Army Corps of Engineers, Honolulu District, Michael Yatsushiro Revised: 22 May 02

(Include on all drawings for all projects with fire alarm systems. Delete or add to this matrix when necessary)

| Legend:<br><br>1=Activation of supervisory alarm required only if there is a fire alarm panel and annunciator. O=Mandatory sequence | System output: | Transmit alarm to Emergency Forces | Transmit Supervisory alarm to Emergency Forces | Transmit Trouble Alarm to Emergency Forces | Activate visible and audible alarm annunciator | Activate visible and audible supervisory annunciator | Activate visible and audible trouble annunciator | Activate all occupant notification appliances | Release door to close | Activate sounder base alarms in all dwelling units in building | Activate all sounder base alarms in only dwelling unit | Activate sounder base in dwelling unit room | Shut down air handling fan | Release all doors in stair to close if controlled by magnetic door holders | Initiation devices and occupant notification appliances operation | Disconnect power to computers in room. | Shutdown elevator power | Initiate Special Elevator Recall (see elev spec) | Initiate Elevator Emergency Recall Phase I, Cab to designated level | Initiate Elevator Emergency Recall Phase I, Cab to alternate level | Alarm annunciation in elevator cab | Open preaction/deluge or dry pipe sprinkler valve. | Close all fire/smoke dampers in duct penetrating computer room wall. | Local sprinkler alarm gong activated upon sprinkler flow |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System Input: | | | | | | | | | | | | | | | | | | | | | | | | |
| Sprinkler riser or floor water flow or pressure switch | | O | | | O | | | O | | O | | | | | | | | | | | | | | O |
| Sprinkler valve tamper switch | | | O | | | O | | | | | | | | | | | | | | | | | | |
| Elevator sprinkler flow switch (Elev mach rm only. Wet pipe or preaction spklr sys). | | O | | | O | | | O | | O | | | | | | | O | | | | | | | O |
| Hydraulic elevator hoistway pit sprinkler flow switch (Locate spklr head no higher than 2' above pit floor. Use dry heads in freezing areas) | | O | | | O | | | O | | O | | | | | | | | | | | | | | O |
| Heat detector for elevator preaction sprinkler system located max 2' from spklr head in hydraulic elev hoistway pit & elev mach rm | | O | | | O | | | O | | O | | | | | | | | O | | | | O | | |
| Loss of voltage to control circuit for the disconnecting elevator power | | | O | | | O | | | | | | | | | | | | | | | | | | |
| Elevator machine rm smoke detector | | | O | | | O | | | | | | | | | | | | | O | | O | | | |
| Elevator lobby fire detection device, designated level | | O | | | O | | | O | | | | | | | | | | | | O | | | | |
| Elevator lobby fire detection device on other levels | | O | | | O | | | O | | | | | | | | | | | O | | | | | |
| Manual pull station | | O | | | O | | | O | | O | | | | | | | | | | | | | | |
| Dwelling unit smoke detector w/sounder base (multiple rooms in dwelling unit) | | | 1 | | | 1 | | | | | O | | | | | | | | | | | | | |
| Dwelling unit smoke detector w/sounder base (single room type dwelling unit) | | | 1 | | | 1 | | | | | | O | | | | | | | | | | | | |
| Single break or single ground fault in fire alarm circuit | | | | O | | | O | | | | | | | | O | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Supply duct smoke detector (>2000 CFM) | | | O | | | O | | | | | | | O | | | | | | | | | | | |
| Return duct smoke detector (>15000 CFM & vertical routing thru floor) | | | O | | | O | | | | | | | O | | | | | | | | | | | |
| Loss of air pressure in single interlocked preaction sprinkler system | | | O | | | O | | | | | | | | | | | | | | | | | | |
| Heat detector in single interlocked preaction sprinkler system. | | O | | | O | | | O | | O | | | | | | | | | | | | O | | O |
| | | | | | | | | | | | | | | | | | | | | | | | | |

NOTES:
1. If sequence indicated here conflicts with specification, this control sequence supercedes specification sequence.
2. The operation sequence indicated here is not complete. Provide other operations in accordance with NFPA 72 and Contract documents.
3. This sequence of operations are considered to be minimum. Designer may add input/output with approved coordination with the Authority Having Jurisdiction.

NOTE TO ENGINEERS:
This matrix contains all general control sequences in fire alarm systems for the military. Engineer to add additional sequences or delete inputs as necessary for each project with approval by the District Fire Protection Engineer.

ATTACHMENT 6

# FIRE ALARM SEQUENCE OF OPERATION MATRIX

## FIRE ALARM SEQUENCE OF OPERATIONS MATRIX

Edited by: US Army Corps of Engineers, Honolulu District, Michael Yatsushiro — Revised: 22 May 02

(Include on all drawings for all projects with fire alarm systems. Delete or add to this matrix when necessary)

Legend:

1=Activation of supervisory alarm required only if there is a fire alarm panel and annunciator. O=Mandatory sequence

| System output: | Transmit alarm to Emergency Forces | Transmit Supervisory alarm to Emergency Forces | Transmit Trouble Alarm to Emergency Forces | Activate visible and audible alarm annunciator | Activate visible and audible supervisory annunciator | Activate visible and audible trouble annunciator | Activate all occupant notification appliances | Release door to close | Activate sounder base alarms in all dwelling units in building | Activate all sounder base alarms in only dwelling unit | Activate sounder base in dwelling unit room | Shut down air handling fan | Release all doors in stair to close if controlled by magnetic door holders | Initiation devices and occupant notification appliances operation | Disconnect power to computers in room. | Shutdown elevator power | Initiate Special Elevator Recall (see elev spec) | Initiate Elevator Emergency Recall Phase I, Cab to designated level | Initiate Elevator Emergency Recall Phase I, Cab to alternate level | Alarm annunciation in elevator cab | Open preaction/deluge or dry pipe sprinkler valve. | Close all fire/smoke dampers in duct penetrating computer room wall. | Local sprinkler alarm gong activated upon sprinkler flow |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| System Input: | | | | | | | | | | | | | | | | | | | | | | | |
| Sprinkler riser or floor water flow or pressure switch | O | | | O | | | O | | O | | | | | | | | | | | | | | O |
| Sprinkler valve tamper switch | | O | | | O | | | | | | | | | | | | | | | | | | |
| Elevator sprinkler flow switch (Elev mach rm only. Wet pipe or preaction spklr sys). | O | | | O | | | O | | O | | | | | | | O | | | | | | | O |
| Hydraulic elevator hoistway pit sprinkler flow switch (Locate spklr head no higher than 2' above pit floor. Use dry heads in freezing areas) | O | | | O | | | O | | O | | | | | | | | | | | | | | O |
| Heat detector for elevator preaction sprinkler system located max 2' from spklr head in hydraulic elev hoistway pit & elev mach rm | O | | | O | | | O | | O | | | | | | | | O | | | | O | | |
| Loss of voltage to control circuit for the disconnecting elevator power | | O | | | O | | | | | | | | | | | | | | | | | | |
| Elevator machine rm smoke detector | | O | | | O | | | | | | | | | | | | | O | | O | | | |
| Elevator lobby fire detection device, designated level | O | | | O | | | O | | | | | | | | | | | | O | | | | |
| Elevator lobby fire detection device on other levels | O | | | O | | | O | | | | | | | | | | | O | | | | | |
| Manual pull station | O | | | O | | | O | | O | | | | | | | | | | | | | | |
| Dwelling unit smoke detector w/sounder base (multiple rooms in dwelling unit) | | 1 | | | 1 | | | | | O | | | | | | | | | | | | | |
| Dwelling unit smoke detector w/sounder base (single room type dwelling unit) | | 1 | | | 1 | | | | | | O | | | | | | | | | | | | |
| Single break or single ground fault in fire alarm circuit | | | O | | | O | | | | | | | | O | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Supply duct smoke detector (>2000 CFM) | | | O | | | O | | | | | | | O | | | | | | | | | | | |
| Return duct smoke detector (>15000 CFM & vertical routing thru floor) | | | O | | | O | | | | | | | O | | | | | | | | | | | |
| Loss of air pressure in single interlocked preaction sprinkler system | | | O | | | O | | | | | | | | | | | | | | | | | | |
| Heat detector in single interlocked preaction sprinkler system. | | O | | | O | | | O | | O | | | | | | | | | | | | O | | O |
| | | | | | | | | | | | | | | | | | | | | | | | | |

NOTES:

1. If sequence indicated here conflicts with specification, this control sequence supercedes specification sequence.
2. The operation sequence indicated here is not complete. Provide other operations in accordance with NFPA 72 and Contract documents.
3. This sequence of operations are considered to be minimum. Designer may add input/output with approved coordination with the Authority Having Jurisdiction.

NOTE TO ENGINEERS:

This matrix contains all general control sequences in fire alarm systems for the military. Engineer to add additional sequences or delete inputs as necessary for each project with approval by the District Fire Protection Engineer.

ATTACHMENT 7

EXCAVATION PERMIT

# EXCAVATION PERMIT
## U.S. ARMY GARRISON, HAWAII
November 2001

Date Prepared:_____

1. General Information (To be completed by contractor/unit):

   a. Contractor/Unit: _____
   b. Phone No.: _____
   c. Installation/Loc. of Excavation:_____
   d. Project Title:_____
   e. Contract Number:_____

2. Telephone, Cable, Communication, Gas, Utility Coordination:

The Contractor/Unit shall verify and coordinate all underground utilities prior to any excavation work with the following maintenance and service departments. Maintenance or service department must sign on approval line or attach document verifying that they reviewed and agree to excavation as noted above.

a. AT&T (HITS), 3375 Kuapaka Street Suite D120. Terry Robinson, 837-1498.

Remarks:_____
Approve: _____ Disapprove: _____ Date: _____

b. Verizon Hawaii, Permit Section. 3239 Ualena St, 3rd Floor. 840-1444 (LeighAnn). (Note: Provide copy of construction drawings and permit)

Remarks:_____
_____
Approve: _____ Disapprove: _____ Date: _____

c. Oceanic Cable, Engineering and Construction Div. 200 Akamainui St. (Mililani Tech Park). 625-8570. (Bus. Hrs: Mon.-Fri. 0800-1430 hrs.)

Remarks:_____
_____
Approve: _____ Disapprove: _____ Date: _____

d. Sprint, SB Building T697 McCornack Rd. (Field Office). Robert Holguin,674-4511. (Note: Valid for Schofield Barracks only)

Remarks:_____
_____
Approve: _____ Disapprove: _____ Date: _____

e. Infrastructure Management System (Telephone, Data/LAN). EMC, OSPG, Bldg S-220, Room 14, FS. 438-7352 (Charlie). (Complete A, B, C, and D first)

Remarks:_____

_____

Approve: _____ Disapprove: _____ Date: _____

f. BHP Gas Company, Locating Utility Services. 515 Kamakee St. 594-5575. (Note: Provide copy of construction drawings and permit)

Remarks:_____

_____

Approve: _____ Disapprove: _____ Date: _____

3. Directorate of Public Works. Engineering Division. WAAF 113.

The Contractor/Unit shall perform a general site survey and locate all utilities within the effected area prior to any excavation. The contractor/unit shall verify that there are no known existing utilities in question for the affected area by using current utility drawings and toning. All utilities that are not shown on the plans, but have been located in the field shall be shown on the construction as-built drawings. The contractor shall verify that all water, sewer, electrical, and drainage utilities have been identified. If any questions arise, the contractor/unit shall contact the undersigned.

The equipment operator shall closely monitor the excavated material for significant changes in color, size (gradation), and type of material. Such changes may indicate the presence of an unmarked utility. If such changes are noted, the contractor/unit shall cease all excavation by equipment, and probe by hand. If any questions arise, the contractor/unit shall contact the undersigned.

Remarks:_____

_____

Approve: _____ Disapprove: _____ Date:_____

Rod H. Oshiro
Structural Engineer
DPW 656-2942 ext. 3029

4. The contractor/unit shall submit a completed form to the contracting officer assigned to this project prior to any excavation. The contractor/unit shall maintain this permit on site at all times during excavation. This application becomes a certified excavation permit after all utility agencies have approved the appropriate sections and the contracting officer or project manager has signed below.

Completed Permit Application Received By:

_____

Contracting Officer / Project Manager Date

ATTACHMENT 8

# LANDSCAPE DESIGN ANALYSIS

9. LANDSCAPE DESIGN

9.1 Objectives: The landscape of Quad C shall provide an aesthetically pleasing setting and a quality environment that creates a sense of place and pride for the Soldiers who will work and live in the barracks complex. The streetscape plantings of Foote Avenue and the Quad C parking lots shall integrate the various functional areas to unify the historic district of Schofield Barracks. The landscape plan shall enhance the installation=s image by implementing the recommendations of the Exterior Architectural Plan and the Cultural Resources Management Plan. The plan shall conform to antiterrorist/force protection guidelines and apply the principles of sustainable design and traffic calming. The design shall promote simplicity, apply best management practices, and select appropriate materials to achieve visual quality at low to moderate maintenance costs.

9.2 References. The following references are available for review at the Agronomy Office, Directorate of Public Works located at Building 113, Wheeler Army Airfield, Oahu, Hawaii.

9.2.1 Schofield Barracks: Installation Exterior Architectural Plan (IEAP), U.S. Army Corps of Engineers, October 1`986.

9.2.2 Schofield Barracks: Cultural Resource Management Plan, U.S. Army Corps of Engineers, April 2000.

9.2.3 Streets and Sidewalks, People and Cars, The Citizen=s Guide to Traffic Calming, Dan Burden, April 2000.

9.2.4 Sustainable Training Regimen for Planners, Architects, and Engineers, Department of Defense, 2000.

9.2.5 How to Save Trees During Construction, Tree City USA Bulletin No. 7, National Arbor Day Foundation.

9.2.6 Trees and Development: A Technical Guide to Preservation of Trees During Land Development, Nelda Matheny and James Clark, 1998.

9.2.7 City and County Ordinance No. 00-54, Exceptional Trees, City and County of Honolulu.

9.3 Design Considerations

9.3.1 Antiterrorism/Force Protection (AT/FP). The AT/FP guidance discourages landscape plantings that exceed 6 inches in height within 30 feet of a barracks building. This requirement shall result in the removal of the existing shrubs, hedgerows, groundcover, and the majority of trees growing close to the structures of the quad. New landscape plantings are allowable within the 30 feet standoff distance as long as the trees have single trunks and have upright (columnar or round-shaped) canopies. Canopies of mature trees shall not have low hanging branches and shall clear the building by 15 feet.

9.3.2 Historic Preservation Landscape Program. The large, mature trees such as monkey pods, ear pods, banyans, silk oaks, and tall Norfolk Island pines and royal palms are characteristic of the landscape of the quads and the preservation of these heritage trees is important in maintaining the ambience of the historic district. In addition, tree gaps created by earlier tree removals shall be filled in with new plantings of the same tree species

to re-establish the rhythmic pattern of the streetscape. Another important feature of the historic district is the open spaces such as the green belt along Meigs Avenue and the central court of the quad that were key elements of the original installation layout.

9.3.3 There are no Exceptional Trees protected by City and County of Honolulu ordinance in the project site.

9.3.4 Foote Avenue Corridor (Glennan Avenue to Meigs Avenue). The establishment of street trees along the length of Foote Avenue shall define this major thoroughfare and create a strong visual edge of the historic district. The Foote streetscape shall mirror the existing shade tree plantings of Waianae Avenue that borders the quads on the north. The tree plantings shall also reduce the scale of the quad building facade, calm traffic, and provide shade to the area. Hedge plantings shall screen the parking lots to visually unify the area and reinforce the integrity of the historic district. Wide walkways on both sides of this main corridor shall promote pedestrian and bicycle traffic.

9.3.5 Screens and Buffers. The use of trees, hedgerows and other landscape screening methods shall conceal unsightly areas or structures to enhance visual image.

9.3.6 Plant Selection. The landscape plants shall reinforce a tropical theme with emphasis on the use of palm trees. When possible, material selection shall reflect the orange and yellow colors of the 25th Infantry Division=s insignia. Plant species shall be easy to maintain, locally hardy, and tolerant to the specific site conditions. The use of suitable native species is encouraged. Poisonous plants and trees that bear edible fruit, are very littersome, or have aggressive root systems shall not be utilized.

9.3.7 Sustainable Sites Design. The project shall minimize site disturbance to prevent soil erosion and to protect the existing trees and their roots. The design shall minimize off-site storm water runoff by promoting the use of pervious surfaces. The landscape design shall integrate water conservation measures by installing hardy native plants, drip irrigation systems, and mulches. The design shall apply alternative treatments to minimize lawn areas and landscape for energy conservation by planting appropriate shade trees in locations to cool adjacent streets, parking lots, walkways, and buildings.

9.3.8 Minimize Tree Conflicts. The design shall select tree species with non-aggressive root systems to minimize tree root conflicts with foundations, sidewalks, and underground utilities. Tree selection shall also fit (size and shape) the species to match the available growing space above and below ground. The design shall locate new tree plantings to avoid potential conflicts. In new planting locations and existing tree sites where root conflicts are inevitable, install treatments that will mitigate the situation.

9.4 Landscape Minimum Requirements

9.4.1 Tree Preservation and Removal

9.4.1.1 The preliminary inventory of existing trees for the project area is shown in the attached RFP reference drawing entitled TREE PRESERVATION AND REMOVAL PLAN. (Note that additional existing tree inventory information will be shown on the topographic survey and will be provided to the Offeror during the advertising period.) This plan classifies each individual tree into one of four classes as indicated below:

9.4.1.2 Reserved.

9.4.1.3 Class A category. Designated trees shall be saved in place.

9.4.1.4 Class B category. Designated trees shall be relocated within the project site. New location of the trees shall be indicated in the landscape planting plan.

9.4.1.5 Class C category trees shall be removed during the demolition phase of construction.

9.4.1.6 Tree Protection Zone. No grading, compaction, or construction activity shall occur in this zone immediately surrounding a Class A tree. All underground utilities, storm drains and irrigation lines should be routed outside the tree protection zone. If utilities must traverse the tree protection zone, they shall be tunneled or bored at a depth of 4 feet or greater within the zone. For broad spreading canopy trees, the zone shall extend radially outward to 20 feet from the external surface of the trunk. For all other broadleaf type of tree species, the zone shall extend to 15 feet. For all palm trees, the zone shall extend to 10 feet. The zone shall be entirely enclosed by a temporary fence prior to any demolition work and shall remain in place until all site work and building construction are completed. The location of all Class A trees shall be identified in the offeror=s Demolition Plan, Landscape Plan, Grading, and Utility Plans.

9.4.1.7 Tree Protection During Demolition and Construction

9.4.1.7.1 The Contractor shall retain the services of an arborist who has been certified for at least 5 years with experience in tree protection during construction, tree pruning and transplanting trees. The Contracting Officer shall approve the selection of the certified arborist. The arborist shall provide consulting services and perform quality assurance duties during the contract period. The arborist shall serve as the Contractor=s liaison with The Outdoor Circle on matters pertaining to the protection of the trees on the project site. The arborist shall also ensure that branch and root pruning and tree relocation work are performed in accordance with standards of the National Arborist Association and the International Society of Arboriculture; proper measures are taken to protect the canopies and root systems of the trees from unnecessary damage from construction activity; when potentially damaging construction activity is performed, that such activity is performed in a manner that will minimize damage to the tree; and trees are provided proper care and remain in good health during the demolition and construction period.

9.4.1.7.1.2 The Contractor shall arrange a pre-construction meeting attended by the Contractor, subcontractors, Contracting Officer and selected consultants, and the Contractor=s certified arborist to review procedures for performing tree-related work, work in the areas of saved trees, access routes, storage areas, and measures to protect trees during construction.

9.4.1.7.1.3 Protection Fence. The Contractor shall erect a temporary fence around each saved tree such that the fence encloses the tree protection zone as a minimum (Diagram 1). The fences shall be erected prior to the commencement of any work and shall not be removed until all work that is potentially injurious to the trees is completed. If an existing structure prevents proper enclosure of the tree protection zone prior to demolition, the Contractor shall initially erect the fence around the tree to the extent that is reasonably possible. After demolition, the fence shall be reconfigured to enclose the tree protection zone. Protection fences shall not be relocated or removed without the written permission of the arborist.

9.4.7.1.4 Limitation of Construction Activities under Existing Tree Canopies. The Contractor shall limit activities under the canopy of existing trees to only those activities explicitly required to complete the

construction under and/or adjacent to the tree=s canopy as shown and specified. All excavation work required under the canopy of the tree shall be performed under the direction of the arborist. Material and topsoil stock piling, vehicle parking, temporary roadways, construction material mixing, portable latrine, and field office will not be allowed under the canopy. Spoils, waste, and washout water shall not be deposited or stored, either temporarily or permanently, under the canopy.

9.4.1.7.1.5 Tree Pruning. A certified tree worker under the general supervision of a certified arborist shall perform the tree pruning and root pruning work.

9.4.1.7.1.6 If injury should occur to any tree during construction, the Contractor shall immediately report the injury to the certified arborist. The certified arborist shall evaluate the injury and apply appropriate treatments. The Contractor shall submit a written report of the tree injury and treatment to the Contracting Officer.

9.4.1.7.1.7 Tree Maintenance. The Contractor shall irrigate the trees as necessary to maintain their health during the course of the demolition and construction period. Groundcover growth within the fenced-in area shall be maintained at a height not to exceed 250 mm (10 in). The application of herbicides is prohibite4d under the canopy of the trees.

9.4.1.7.1.8 Root Pruning. Before grading, pad preparation, or excavation for foundations, footings, walls, or trenching, prune roots that are greater than two (2) inches in diameter by manually digging a trench and cutting exposed roots with a saw, vibrating knife, rock saw, narrow trencher with sharp blade, or other approved root pruning equipment. Any roots damaged during grading or construction shall be exposed to sound tissue and cut cleanly with a saw.

9.4.1.7.1.9 If temporary haul or access roads must pass over the root area of trees, a roadbed of 6 inches of mulch or gravel shall be created to protect the soil. The roadbed material shall be replenished as necessary to maintain a 6-inch depth.

9.4.2 New Tree Plantings for Restoration. Provide Silk Oak (Grevillea robusta) trees to fill in gaps in the street lawns bordering parking areas on the west-side of Flagler Avenue, the north-side of Foote Avenue, and the west-side of Meigs Avenue.

9.4.3 Landscape Building 355 Front Entrance on Waianae Avenue. Provide landscaping to enhance and accentuate the entryway of the building.

9.4.4 Quadrangle C Signage. Provide lighted signage to identify "Quadrangle C". Also, indicate its year of construction "Est. 1915". The sign architecture shall be compatible with the character of building 355. Minimum sign size 2.5 feet x 4 feet excluding base. Lettering shall be pin mounted. Place sign in an appropriate location along Waianae Avenue. Provide landscaping to accentuate signage.

9.4.5 Landscape Front Entryway Courtyards of Buildings 356, 357, and 358. Design an entrance space to the buildings that will accommodate and direct pedestrian traffic and create an atmosphere for socializing. Place more emphasis on the development of the center entryways and less on the side courtyards. As a minimum requirement, provide an informal grouping of a single-trunk type of palm species for the center entryways of each building. Each planting group shall consist of a minimum of 3 specimens. The same design shall be applied to the 3 buildings.

9.4.6 Foote Avenue Corridor Streetscape. Plant a minimum of 8 royal palm specimens in the street lawn fronting Foote on the south side of the parking lot west of building 356. The height of furnished palms shall match the 2 existing royal palms in the lawn. Provide a hedgerow to screen the parking lot with an allowance of 2 feet of car overhang into the planter strip.

9.4.7 Quad C Interior Court. Provide a minimum of 10 medium-sized canopy shade trees around the perimeter of the court that will complement the existing African Tulip tree located in the north corner. The tree species shall not be Kukui or Formosa Koa which are planted in the courts of the other quads.

9.4.8 Landscape Memorial. The memorial plaque is located at the east entry into the quad complex on Waianae Avenue. Provide paved sidewalk with a minimum width of 5 feet from the curbing to the plaque. Provide plantings to define and accentuate the memorial.

9.4.9 Screen Plantings. Provide plantings to screen unwanted views of trash enclosures, utility pad mounts, etc. that are outside of the AT/FP standoff zone of 30 feet from buildings.

9.4.10 Turf Plantings.

9.4.10.1 St. Augustine (*Stenotaphrum secundatum*): Establish grass around building 355, in center and side courtyards of buildings 356, 357, and 358 and in all other areas where sunlight conditions do not favor common bermuda grass growth.

9.4.10.2 Common Bermuda (*Cynodon dactylon*): Establish grass in the central court of the quad complex and in all other turf areas within the project site not planted with St. Augustine. Disturbed ground areas outside of the project area shall also be re-established with bermuda grass.

9.4.11 Tree Planting Material Requirements

9.4.11.1 Palm species: field stock, trunk height 10-20 feet, trunk unmarked with a diameter measurement not less than 6 inches along any point of the trunk. Specimens in a group planting shall have staggered heights. Suitable palm species are Alexander (Archontophoenix Alexandra), Joannis (Veitchia joannis), Fiji (Pritchardia pacifica), Princess (Dictyosperma album), Foxtail (Wodyetia bifurcata), Queen (Syagrus romanzoffianum), and Black (Normanbya normanbyi).

9.4.11.2 Medium-sized canopied shade tree (species not identified): pot size 25 gallons, trunk caliper not less than 2 inches, height not less than 8 feet.

9.4.12 Quality of Planting Material. All plant material furnished shall have a habit of growth that is normal for the species and shall be healthy and free from disease, insects and injuries. Trees and shrubs shall have well developed branching with vigorous root systems. Roots must fill containers, but show no evidence of being or having been root bound. Trunks shall be reasonably straight and symmetrical with crown and have a persistent main leader. Trees shall not be Apoled@ or the leader removed. Any tree or shrub with a weak, thin trunk not capable of supporting itself when planted in the open will be rejected. Plants shall equal or exceed measurements specified in the planting plan, which will be the minimum acceptable sizes after pruning. If any plant specified is not obtainable, submit a written substitution presenting either a different size of the same species or a similar alternate species. Substitutions of plant materials will not be permitted unless authorized.

9.4.13 Imported Screened Topsoil. New topsoil at a minimum of 6 inches deep shall be furnished for the newly planted areas in the front and side courtyards of buildings 650, 651, and 652. The topsoil shall be fertile, friable of loamy character, and amended with humus material. The soil shall have passed through a 6.4 mm screen. The topsoil shall be free of weed seeds, other viable plant material such as nutgrass, stones, and other deleterious substances.

9.4.14 On-Site Topsoil. Except for the areas identified in paragraph above, all areas shall use the saved topsoil from the site. Soil tests shall be performed for pH, chemical analysis and mechanical analysis to establish the quantities and type of soil amendments required for the type and variety of plant material specified. The saved topsoil shall be amended per recommendations of the soil test. If the stored site=s topsoil is not sufficient to cover the landscaping needs, additional topsoil shall be provided by the contractor from an approved off site source.

9.4.15 Root Barriers. Root barriers shall be provided for new plantings of the broadleaf trees in the parking lots and streetscapes. In addition, provide root barriers for saved broadleaf trees located close to the pavements and foundations. Barriers shall be woven fabric, minimum 19.5 inches in width, with integral chemical nodules. Linear type of application method of the root barrier shall be used rather than encircling the tree root ball.

9.4.16 Landscape Edging. Bed dividers shall be provided to separate shrub beds, tree wells, and mulch treatments. Plastic header shall be flexible, resin-formulated edging 5.25 inches high and have a 1.12 inch diameter bead; designed with ribbed sides and a t-shaped bottom; heavy duty grade construction; and sun guarded, carbon black for UV protection.

9.4.17 Mulch Applications. Organic and/or inorganic mulch treatments shall be provided in shrub beds, planter wells, and in appropriate areas where it can serve as a cost-effective alternative to turf groundcover. As a minimum, organic mulch material shall be stable, fully composted green waste; gray to dark brown; no odor; ph 7-8; 80% of the material shall pass through a screen of 3 inches or smaller; and free of viable weed seeds, litter, and deleterious material.

9.4.18 Percolation Test. Test for percolation shall be performed to determine positive drainage of plant pits and beds. All soil and drainage conditions detrimental to the growth of plant materials shall be identified and a proposal correcting the conditions shall be submitted.

9.4.19 Installation of Plant Material. For tree pits in parking lots, minimum size of planting hole shall be 5 feet by 5 feet by 3 feet deep. Remove existing pavement, base course, and sub-base course and backfill with topsoil and compact to 70% of maximum density. When obstructions below ground or poor drainage affect the planting operation, proposed adjustments to plant location, type of plant and planting method or drainage correction shall be submitted. For all other plan pits, excavate and backfill as recommended by the trade and ANSI Z60.1.

9.4.20 Maintenance During Planting Operation. Installed plants shall be maintained in a healthy growing condition. Maintenance operations shall begin immediately after each plant is installed and shall continue until the plant establishment period commences.

9.4.21 Maintenance During Establishment Period.

9.4.21.1 The maintenance period shall begin upon written acceptance of the planting operations and continue for 365 days thereafter. During this period, provide plants with optimum growing conditions and maintain the appearance of the planted areas.

9.4.21.2 The maintenance of plants shall include, but no limited to, straightening plants, tightening stakes and guying material, repairing tree wrap, protecting plant areas from erosion, maintaining erosion material, supplementing mulch, removing dead or excessive growth by pruning, maintaining edging of beds, checking for girdling of plants, watering, fertilizing, weeding, insects and diseases pest control, removing and replacing unhealthy plants and unsatisfactory turf areas, mowing turf, and removing plant and litter debris.

9.4.21.4 Restricted use pesticides shall not be utilized. All pesticide applications, regardless of pesticide application, shall be performed or supervised by personnel that are certified by the State of Hawaii to apply pesticides in the Ornamental Plants and Turf category.

9.4.22 Automatic Irrigation System.

9.4.22.1 Provide permanent fully automatic irrigation systems for the landscape and turf areas surrounding buildings 355, 356, 357, and 358; the central court of the quad; and the street lawn of the Quad C parking lot along Foote Avenues.

9.4.22.2 A computer based controller(s) shall be provided with rain sensors. For the quad court, install Hunter I-40 rotor Pop-up with check valve and stainless steel riser (or equivalent) irrigation heads with triple-swing joint connection to the lateral.

9.4.22.3 Place main lines a minimum of 18 inches and laterals 12inches below finished grade. Place pipes and electrical wiring crossing pavement at least 18 inches below finish grade at sidewalks and 2 feet below finish grade at roadways. Install electrical wiring below irrigation pipes for protection. Provide appropriately sized sleeves for all pipes going under sidewalks and roads.

9.4.23 Reserved.

9.4.24 Disposal of green waste material shall be outside the limits of Government property, and shall be the contractor=s responsibility. The contractor may at his option dispose of trees and shrubs by chipping the green waste and applying the material as a mulch layer 100 to 150 mm (4 to 6 in.) thick over bare ground surfaces of training grounds at Schofield Barracks to control soil erosion. The Director of Public Works, Schofield Barracks, will determine the location of the disposal site.

9.4.25 Warranty.

9.4.25.1 Furnished plant materials shall be guaranteed to be in a vigorous growing until completion of the maintenance period. Plants that decline or die during the warranty period shall be replaced using the same kind and size as originally planted. The warranty shall also apply to existing trees on the job site that are either saved in place or relocated (transplanted).

9.4.25.2 Furnished irrigation system shall be guaranteed to be in full operation during the maintenance period. Material and equipment found to be defective due to faulty material or workmanship shall be

immediately repaired or replaced. The contractor is responsible for damage caused by the irrigation system during the installation or the warranty period due to failure of workmanship or materials.

ATTACHMENT 9

# BLAST AND PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT

# *BLAST and PROGRESSIVE COLLAPSE VULNERABILITY ASSESSMENT*

WHOLE BARRACKS RENEWAL
BRIGADE COMPLEX, PHASE 3A, QUAD C
FY03 MCA PN52068 & BUP 52069
SCHOFIELD BARRACKS, OAHU, HAWAII

## *VOLUME ONE*

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PREPARED FOR:

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# 1.0 INTRODUCTION

This section summarizes the tasks performed by Hinman Consulting Engineers, Inc. and includes a discussion of typical explosion effects on buildings. The site and buildings are described in Section 2. Section 3 summarizes the blast analysis, and retrofit recommendations and progressive collapse requirements are given in Section 4. Building layout sketches showing recommended retrofits and a list of drawings reviewed are included in the appendix.

## 1.1 Background

Mitsunaga & Associates, Inc. contracted Hinman Consulting Engineers, Inc. to perform an air-blast and progressive collapse vulnerability assessment and develop conceptual retrofit recommendations for Buildings 355, 356, 357, and 358 which comprise Quad "C" at Schofield Barracks in Oahu, Hawaii. This report summarizes the methods, findings and recommendations of this assessment.

## 1.2 References

The following references were used in the preparation of this report:

- *DoD Anti-Terrorism / Force Protection (AT/FP)Minimum Standards for Buildings, UFC 4-010-01*, dated 31 July 2002 [1];
- *Department of Defense Interim Antiterrorism/Force Protection Construction Standards Guidance on Structural Requirements*, dated March 5, 2001 [2];
- Excerpts from the original design drawings, dated 1917. Drawings reviewed were primarily for Building 355;
- Drawings for the Modernization of Barracks Quads C& J and Medics Area, dated 1973;
- Corps of Engineers seismic upgrade drawings for FY03 MCA PN 52068 & BUP PN 52069 PH3A, dated 2001.

A detailed list of all drawings reviewed is included as an appendix to this report.

## 1.3 Tasks Performed

Based on above listed references, Hinman Consulting Engineers, inc. has performed the following tasks for this report:

- Determined critical threat locations;
- Determined air-blast parameters for the critical threat locations;
- Performed dynamic analysis of walls, columns, floor systems, roof systems and windows to assess their response to the determined air-blast parameters;
- Performed static and dynamic analysis of perimeter structural elements to determine their resistance to progressive collapse; and
- Developed conceptual level retrofit schemes to bring the buildings into compliance with the requirements of the standards referenced above.

## 1.4 Limitations and Exclusions

The following are the limitations and exclusions of this report:

- Detailed design was not included in the scope of this work and is to be performed by the Design/Build contractor in consultation with a qualified blast consultant;
- Where specific drawings were not available, the following was assumed
  - Details provided for one building, were assumed to be the same for all buildings;
  - Where no details were available, layout and details found during our analysis of Schofield Barracks, Quad F, were assumed;
- Retrofit recommendations included in the Corps of Engineers seismic upgrade design drawings were assumed to be constructed and were therefore used in our analysis, where applicable;
- Site retrofits (i.e. installation of vehicle access arms at the entry points to the inner quad area) were assumed to be installed;
- Analysis of the recommended retrofits for standard and other abnormal loading conditions (i.e. seismic loading) was outside the scope of work and should be performed prior to final design and construction;
- Analysis of existing foundations to determine their capacity to resist the loads generated from air-blast loading was outside the scope of work and should be performed prior to final design and construction;
- Cost estimating was not included in the scope of work for this report; and
- Review of the project for overall compliance with Antiterrorism requirements aside from air-blast response and progressive collapse is beyond the scope of work for this report.

## 1.5 Explosion Effects and Building Response

The principles underlying our blast analysis and recommendations for the windows are derived from the general effects of explosions on buildings. These effects and subsequent calculations are described in the military manual TM5-1300 [3], the text on structural dynamics from Biggs [4], and ConWep [5]. In this section, we explain these effects briefly, as a background for the subsequent analysis and upgrade discussions.

### 1.5.1 Explosive Effects

An explosion is an extremely rapid release of energy in the form of light, heat, sound, and a shock wave. The shock wave consists of highly compressed air traveling radially outward from the source at supersonic velocities. As the shock wave expands, pressures decrease (with the cube of the distance), and when it meets a surface that is in line-of-sight of the explosion, it is reflected and amplified by a factor of up to thirteen.

The magnitude of the reflection factor is a function of the proximity of the explosion and the angle of incidence of the shock wave on the surface. The pressures decay rapidly over time (i.e., exponentially) and have a very brief span of existence, measured typically in thousandths of a

second, or milliseconds. Diffraction effects, caused by corners of the building, may act to confine the air-blast, prolonging its duration. Late in the explosive event, the shock wave becomes negative, creating suction. Behind the shock wave, where a vacuum has been created, air rushes in, creating a powerful wind or drag pressure on all surfaces of the building. This wind picks up and carries flying debris in the vicinity of the detonation. In an external explosion, a portion of the energy is also imparted to the ground, creating a crater and generating a ground shock wave analogous to a high-intensity, short-duration earthquake.

For an explosive threat defined by its charge weight in pounds of TNT-equivalent, **W**, and its distance from the target, or standoff, **R**, the peak pressure and impulse of the shock wave are evaluated using charts available in military handbooks. The *impulse* is defined as the area under the pressure versus time curve (i.e., the integral of pressure with respect to time). The duration of the loading, **td**, is defined in this report as the duration of a linearly decaying function having the peak impulse, **I**, and pressure, **P**, of the actual air-blast (i.e., **td = 2 I/P**). Because this duration is somewhat different from the actual duration (which is based on an exponentially decaying function), it is referred to as an "equivalent" duration.

### 1.5.2 Building Damages Due to Explosions

The extent and severity of damage and injuries in an explosive event cannot be predicted with perfect certainty. Past events show that the unique specifics of the failure sequence for a building significantly affect the level of damage.

For instance, two adjacent columns of a building may be roughly the same distance from the explosion; but in the explosion, only one fails because it is struck by a fragment in a particular way which initiates collapse. The other, by chance, is not struck and holds. Similarly, glass failures may occur outside of the predicted areas. Also, the details of the physical setting surrounding a particular building occupant may greatly influence the level of injury incurred. Moreover, the position of the person, seated or standing, facing towards or away from the event as it happens, may result in injuries ranging from minor to severe.

Despite these uncertainties, it is possible to give some general indications of the overall level of damage and injuries to be expected in an explosive event, based on the size of the explosion, distance from the event, and assumptions about the construction of the building. Additionally, there is strong evidence to support a relationship between injury patterns and structural damage patterns.

Damage due to the air-blast shock wave may be divided into direct air-blast effects and progressive collapse. Direct air-blast effects are damage caused by the high-intensity pressures of the air-blast close in to the explosion. These may induce the localized failure of exterior walls, windows, floor systems, columns, and girders.

Progressive collapse refers to propagation of structural failure to members above and to the side of the damaged area, causing extensive collapse of a portion or all of the building. Progressive collapse may or may not occur, depending on the design and construction of the building, the members lost due to direct air-blast effects, and other factors.

The shock wave is the primary damage mechanism in an explosion. The pressures it exerts on building surfaces may be several orders of magnitude greater than the loads for which the building is designed. The shock wave also acts in directions that the building may not have been designed for, such as upward on the floor system. In terms of sequence of response, the air-blast first impinges on the weakest point in the vicinity of the device closest to the explosion, typically the exterior envelope of the building. The explosion pushes on the exterior walls at the lower stories and may cause wall failure and window breakage. As the shock wave continues to expand, it enters the structure, pushing both upward and downward on the floors.

Floor failure is common in large-scale vehicle-delivered explosive attacks, because floor slabs typically have a large surface area for the pressure to act on and a comparably small thickness. In terms of the timing of events, the building is engulfed by the shockwave and direct air-blast damages within tens to hundreds of milliseconds from the time of detonation. If progressive collapse is initiated, it typically occurs within seconds of the explosion.

Severity and type of injury patterns incurred in explosive events may be related to the level of structural damage. A general summary of the relationship between the type of damage and the resulting injuries is given in Table 1.

**Table 1. Damages and Injuries due to Explosion Effects**

| Distance from Explosion | Most Severe Building Damage Expected | Associated Injuries |
|---|---|---|
| Close-in | Building Collapse | Fatality due to falling down floor levels and being crushed by falling structural components |
| Moderate | Exterior wall failure, exterior bay floor slab damage | Skull fracture, concussion |
| Far | Window breakage, falling light fixtures, flying debris | Lacerations from flying glass, abrasions from being thrown against objects or objects striking occupants |

### 1.5.3 Glass Hazards

Glass is often the weakest part of a building, breaking at low pressures compared to other components such as the floors, walls, or columns. Past incidents have shown that glass breakage may extend for miles in large external explosions. High-velocity glass fragments have been shown to be a major contributor to injuries in such incidents. For incidents within downtown city areas, falling glass poses a major hazard to passersby and prolongs post-incident rescue and clean-up efforts by leaving tons of glass debris on the street.

Explosion-related injuries are classified as primary, secondary, and tertiary. Glass breakage contributes to all three of these injury groups. The high pressure of the air-blast that enters through broken windows causes eardrum damage and lung collapse (or "primary" injuries). As the air-blast damages the building components in its path, missiles are generated which cause impact injuries (or "secondary" injuries). Airborne glass fragments typically cause penetration-

or laceration-type injuries. Larger (non-glass) fragments may cause non-penetrating, or blunt trauma, injuries. Finally, the air-blast pressures cause occupants to be bodily thrown against objects or to fall ("tertiary" injuries). These effects are summarized in Table 2.

**Table 2. Explosion-Related Injury Types**

| Injury Classification | Injury Type | Cause |
|---|---|---|
| Primary | Eardrum rupture, lung collapse | Air-blast pressure levels |
| Secondary | Lacerations and blunt trauma injuries | Missile impact |
| Tertiary | Being thrown or falling due to the force of the explosion | Air-blast pressure impact |

Lacerations due to high-velocity flying glass fragments have been responsible for a significant portion of the injuries received in explosion incidents. In the bombing of the Alfred P. Murrah Building in Oklahoma City, for instance, 40% of the survivors within the Murrah building cited glass as contributing to their injuries. Within nearby buildings, laceration estimates ranged from 25% to 30% [6].

# 2.0 SITE AND BUILDING DESCRIPTION

This section describes the site layout and building descriptions.

## 2.1 Building Location and Layout

The four buildings are grouped together to form what is referred to as Quad C in Schofield Barracks on the island of Oahu, Hawaii. Quad C is located inside the Schofield Barracks facility, more than 150 feet from the installation perimeter. The Quad is surrounded by streets on four sides (Figure 1). Access roads lead into an inner quad area, which has recreation facilities as well as limited parking. This study assumes that vehicle control devices (i.e. access arms) are installed at the entrance to these access roads so that only emergency and maintenance vehicles may gain access to this area. Trees and shrubbery are scattered on the lawns around the perimeter of the buildings. A chiller plant and fire pump house are located east of Building 358.

## 2.2 Distances to Roads and Parking Areas

The distances from the edge of pavement of roads and parking areas to the face of the building is known as the standoff distance. These distances are used in determining the critical threat locations for the air-blast analysis and are shown in Table 3 below.

**Table 3. Distances from Roads and Parking Areas to Face of Buildings**

| Building | Distance (ft) |
|---|---|
| 355 | 22.4 |
| 356 | 10.4 |
| 357 | 20.2 |
| 358 | 32.8 |

## 2.3 Building Construction

All four buildings were constructed circa 1917 and have reinforced concrete floor slabs supported by reinforced concrete beams and columns. The exterior walls are 8 inch thick reinforced concrete at the first two floors, and 6 inches thick at the third floor. The roof system originally consisted of plywood supported by wood trusses at building 355. This has since been modified to metal decking supported by steel open-web trusses. Additionally, per the seismic evaluation report by the Corps of Engineers, the roof system for Buildings 356, 357, and 358 is scheduled to be modified to metal decking supported by structural steel "I" beams. This is the system evaluated for the purposes of this report.

### 2.3.1 Buildings 356, 357, and 358

Buildings 356, 357, and 358 are all rectangular with two "bump outs" located at the one-third points on the inner quad side of the buildings (see building layout sketches in the appendix).

These buildings have exterior corridors and stairs facing the inner quad. These exterior stairs are the only means of access and egress for the upper floors.

### 2.3.2 Building 355

Building 355 is rectangular with an exterior corridor and stairs on the inner quad side of the building. Like the other buildings, the stairs provide the only means of access and egress for the upper floors. An open passageway at the center line of the building leads from the street to the inner quad area.

### 2.4 Building Classifications

The buildings will be used either for troop billeting or administrative functions (offices) and therefore are classified as 'Primary Gathering Structures' and 'Troop Billeting' by the AT/FP criteria.

### 2.5 Buildings Threat/Risk Analysis

No threat has been provided for these buildings, in this situation, the AT/FP criteria require that a 'Minimum Protection Level' is to be met. The buildings were analyzed for loads from detonation of a weapon with an Explosive Weight II per Table 1 of the Department of Defense *Minimum Antiterrorism Standoff Distances for Buildings*, (see reference section 1.2).

## 3.0 MATERIAL PROPERTIES AND EVALUATION CRITERIA

Based on conversations with Jong Namgung of Mitsunaga & Associates, the following material properties are used for the analysis of the existing structures:

| | |
|---|---|
| Reinforcing Steel: | fy= 40,000 psi |
| Concrete: | f'c = 2,500 psi |
| Structural Steel: | fy= 36,000 psi |

The evaluation criteria is based on material, structural member type and whether the analysis is for progressive collapse or air-blast response. Table 4 shows the evaluation criteria used in the analysis for this report.

**Table 4. Evaluation Criteria**

| Material | Structural Element | Air Blast Support Rotation | Air Blast Ductility |
|---|---|---|---|
| Concrete | Slabs | 2 degrees | 15 |
| | Beams | 2 degrees | 15 |
| | Walls | 2 degrees | 15 |
| | Columns | 2 degrees | 3 |
| Steel | Joists | 2 degrees | 2 |
| | Beams | 2 degrees | 10 |
| | Metal Deck | 4 degrees | 6 |

1.5

## 4.0 BLAST RESISTANT DESIGN REQUIREMENTS

All buildings were analyzed for conformance with applicable requirements for blast resistance.

### 4.1 Critical Threat Identification

Critical threats were identified for each of the building faces. For the street face of the buildings, the threat was located at the closest edge of pavement. For the sides of the buildings, it was

determined that the critical threat location was at the edge of pavement closest to the front face of the building. For the inner quad face of the building, the critical threat was located at the edge of pavement directly across from the rear corner of the building. Figure 1 shows these Threat Locations. Table 5 shows the Maximum Pressure and Impulse determined for each building.

**Table 5: Maximum Reflected Pressures and Impulses**

| Building | Reflected Pressure | Reflected Impulse |
|---|---|---|
| 355 | 67.36 psi | 110.0 psi-msec |
| 356 | 453.5 psi | 241.5 psi-msec |
| 357 | 87.19 psi | 122.5 psi-msec |
| 358 | 27.61 psi | 73.86 psi-msec |

The following sub-sections provide additional information regarding pressures and impulses used in the analysis.

### *4.1.1 Building 355*

The side of the building facing the street (Line E) was analyzed for the reflected pressure loading at a 25.4 foot standoff. The side facing the quad (Line A) was analyzed for incident pressure at an 86.9 foot standoff. The short sides of the building (Lines 1 & 20) were analyzed for incident pressure at the 25.4 foot standoff. These standoff distances consist of the actual distance to the edge of the street plus an additional 3 feet to the centerline of the vehicle carrying the weapon. In addition, building elements located in the passageway at the center line of the building, were also analyzed for 25.4 foot incident pressure.

### *4.1.2 Building 356*

The side of the building facing the street (Line E) was analyzed for the reflected pressure loading at a 13.4 foot standoff. The side facing the quad (Line A) along with the "bump outs", were analyzed for incident pressure at a 102.6 foot standoff. The short sides of the building (Lines 1 & 21) were analyzed for incident pressure at the 13.4 foot standoff.

### *4.1.3 Building 357*

The side of the building facing the street (Line E) was analyzed for the reflected pressure loading at a 23.2 foot standoff. The side facing the quad (Line A) along with the "bump outs", were analyzed for incident pressure at an 89.3 foot standoff. The short sides of the building (Lines 1 & 21) were analyzed for incident pressure at the 23.2 foot standoff.

### *4.1.4 Building 358*

The side of the building facing the street (Line E) was analyzed for the reflected pressure loading at a 35.8 foot standoff. The side facing the quad (Line A) along with the "bump outs", were analyzed for incident pressure at a 99.3 foot standoff. The short sides of the building (Lines 1 & 21) were analyzed for reflected pressure at the 56.5 foot standoff.

## 4.2 Technical Approach

Based on the above referenced air-blast loads the following calculations were performed

- Building elements were first checked to determine whether they survived the lowest pressure and impulse (corresponding to the maximum standoff distance) generated by the weapon, this occurs at Building 358. If the element failed from this load, this portion of the analysis was complete, because the other pressures and impulses at the other buildings would be greater due to their greater standoff distances;
- If the element in question survived the load at the largest standoff, it was then analyzed for the actual standoffs for each individual building;
- For elements that survived the explosion at the largest standoff, but not at the actual standoffs, retrofits are recommended on a building-by-building basis.
- Windows were analyzed using the WINGARD [7] computer program. The worst case allowable failure mode is 3B, which corresponds to fragments being propelled into the room a maximum of 10 feet from the window.

## 4.3 Findings and Recommendations

This section presents the finding of the dynamic analysis of the individual structural elements in response to the air-blast induced loads noted above.

### *4.3.1 Building 355*

Figures 2 and 3 graphically show the locations and extent of required retrofits, as noted in the following narrative.

#### *4.3.1.1 Columns*

Analysis was performed for the exterior corridor columns and interior columns. All columns were determined to respond within the defined parameters and therefore no retrofit is required. Note that the loads used for the analysis of the interior columns were reduced to account for the window opening sizes.

#### *4.3.1.2 Beams*

All interior and exterior beams on the second and third floors are determined to fail from upward blast loading due to the lack of top reinforcement at the beam mid-span. In addition second and third floor beams on grid line C & D were determined to fail in shear. A fiber-reinforced polymer (FRP) system is to be installed on top of the floor beams to provide resistance for upward loading. One steel shear plate (10 inches wide, 1/4 inch thick) is to be attached to each vertical side of floor beams to provide additional shear resistance. The length of the plates should be long enough to allow proper attachment to the columns. The failure mode and retrofit recommendations for beams is the same for all buildings analyzed. Connections are to develop the full capacity of the supports.

See the attached building layout sketches (Figures 2 and 3 in the appendix) for locations of retrofit.

*4.3.1.3 Slabs*
The interior and exterior slabs were determined to survive downward blast forces. However, they were determined to fail in upward loading since there is no top reinforcement at mid-span. A FRP system is to be installed on top of interior and exterior slabs to provide resistance for upward loading. Note that the FRP is not a wearing surface and must be protected with a floor covering.

The failure mode and retrofit recommendations for the slabs are the same for all buildings analyzed.

*4.3.1.4 Exterior Walls*
The exterior walls are reinforced concrete (8 inch thick for the first two floors and 6 inch thick for the third floor). The 8 inch wall has two rows of horizontal and vertical reinforcements (3/8 inch diameter bars at 24 inch spacing). The 6 inch wall has one layer of 6x6-#6x#6 wire mesh as the reinforcement.

> *Line B.* Walls on this line were determined to survive the incident pressure and impulse from a blast loading at the 86.9 foot standoff distance.
>
> *Lines E, 1, and 21.* Walls on these lines were determined to fail from air-blast loads. All three floors of exterior walls will be retrofitted with new shotcrete walls installed on the inside face of the exterior walls. The shotcrete walls will have one layer of #6 rebars spaced 6 inch on center in both the vertical and horizontal direction. The first floor requires an 8 inch thick shotcrete wall, while the second and third floor requires a 6 inch thick shotcrete wall. Shotcrete walls are to be thru-bolted to the slabs at the top and bottom edges.
>
> *Lines 10 & 11 (from Lines C to E).* Walls in the passageway are also determined to fail from air-blast loads. These areas require an 8 inch shotcrete wall as previously described.

See the appendix for the attached building layout sketches (Figures 2 and 3) and conceptual retrofit sketch (Figure 11) for more information about the shotcrete wall.

*4.3.1.5 Roof System*
Based on latest architectural drawings, the metal roof deck spans 6 feet. If the span is 6 feet, the metal deck should be equivalent to Verco W2 Formlok 18 Gage in order to resist the air-blast loading. If the metal deck spans 8 feet, then it should be equivalent to Verco N Formlok 18 Gage. No information was available on the existing trusses, we assumed same member as analyzed in Quad F.

*4.3.1.6 Windows*
The architectural retrofit drawings show that the windows on the side of the building facing the inner quad are to be increased in size. This will be accomplished by removing a portion of the

exterior wall under the window. Window sizes on the other sides of the building will remain as they are now. The Corps of Engineers seismic evaluation document calls for double pane windows consisting of two lites of 3/4 inch laminated thermally tempered glass separated by an air space, for all windows facing the street. All other windows are called out to be a minimum single pane 1/4 inch laminated thermally tempered glass. This report recommends different window glass lay-ups and thicknesses based on the actual pressures and impulses from the critical threat locations.

Windows were analyzed for an average pane size. Larger windows may require structural mullions to reduce window thickness. Intermediate muntins are assumed to be decorative and do not provide structural support for the panes. If operable, windows should open outward.

Window response and retrofits are summarized below. Also see the attached building layout sketches, in the appendix, for locations of retrofit. (Figures 2 and 3)

> *Line B.* With the 86.9 foot standoff, the 1/4 inch laminated thermally tempered windows are determined not to crack, and therefore are over-designed. A glass that is annealed, rather than thermally tempered would be more cost effective. A 1/4 inch laminated annealed glass with a minimum 5/8 inch bite will crack with no fragments flying into the room (i.e., failure response of 2), which meets the requirements of the criteria document.
>
> *Lines E, 1, and 20.* With the 25.4 foot standoff, the 3/4 inch laminated thermally tempered double pane windows were determined not to crack, and is therefore also over-designed. A more cost effective design would be an insulating unit comprising of an inner pane of 1/2 inch laminated thermally tempered glass, an outer pane of 1/4 inch monolithic thermally tempered glass and a 1/2 inch air space, and a minimum 5/8 inch bite. The failure mode is also 2, meets the requirements of the criteria document.

All window frames, mullions and anchorage are to be designed to develop the full capacity of the glass (typical, all buildings). Frames and Mullions will most likely be steel.

*4.3.1.7 Doors*

Exterior doors are to be blast resistant. The doors are allowed to fail but must rebound out of the frame away from the interior of the building. Table 6 below shows the pressures and impulses doors should resist, based on the location of the doors.

**Table 6: Pressures and Impulses for Building 355 Exterior Doors**

| Door Locations | Pressures | Impulses |
|---|---|---|
| Street side | 67.36 psi | 110.0 psi-msec |
| Short side | 21.90 psi | 43.73 psi-msec |
| Quad side | 2.46 psi | 14.44 psi-msec |

*4.3.1.8 Foundations*
The existing foundation was not analyzed for their capacity to resist air-blast loading. (See section 1.4, Limitations and Exclusions). The foundation, however, needs to have the capacity to resist the maximum lateral load that can be transferred from the exterior walls. For Building 355, this load is 6000 lbs per foot length of the foundation.

*4.3.1.9 Blast Base Shear*
The blast base shear is provided for comparison with the seismic base shear. For building 355, the blast base shear is 235374 lbs.

### *4.3.2 Building 356*
Figures 4, 5, and 6 graphically show the locations and extent of required retrofits as noted in the following narrative.

*4.3.2.1 Columns*
Analysis was performed for the exterior corridor columns and interior columns.
Columns were determined to survive a blast originating from the critical threat location, no retrofit is required.

*4.3.2.2 Beams*
See Building 355 for description of beam failure modes and retrofit recommendations.

*4.3.2.3 Slabs*
See Building 355 for description of slab failure modes and retrofit recommendations.

*4.3.2.4 Exterior Walls*
The construction of the exterior walls is the same as in Building 355.

> *Line B and at the two "bump outs".* These exterior walls were determined to survive the incident pressure and impulse from a blast loading at the 102.6 foot standoff distance.
>
> *Lines E, 1, and 21.* Walls on these lines were found to fail from air blast loading. All three floors of exterior walls are to be retrofitted with new shotcrete walls. The third floor will get a 6 inch thick shotcrete wall, while the second floor will get 8 inch thick shotcrete wall. These shotcrete walls are to have one layer of #6 rebars spaced 6 inches on center in both the vertical and horizontal direction. The first floor will received a 10 inch thick shotcrete wall with two layers of #6 rebars spaced 6 inches on center in both the vertical and horizontal directions.

See the attached building layout sketches (Figures 4, 5, and 6), and conceptual retrofit sketch (Figure 11) for more information about the shotcrete wall.

*4.3.2.5 Roof System*
The Corps of Engineers seismic evaluation drawings call for the removal and replacement of the existing roof with a steel framed roof with metal decking. The report calls for the use of W10

and W12 steel beams with a 1.5 inch Type "B" 18 Gage metal decking. Blast analysis requires the W10 beam to be at least W10x45, the W12 beam to be at least W12x79, and the 1.5 inch metal deck to be Verco N Formlok 18 Gage, or equal.

*4.3.2.6 Windows*

Similar to Building 355, the windows on the inner quad side of Building 356 are to be increased in size. Window sizes on the other sides of the building will remain the same. The Corps of Engineers seismic evaluation document specifies window thickness and layup identical to those for building 355. This report recommends different window glass lay-ups and thicknesses based on the actual pressures and impulses from the critical threat locations.

Windows were analyzed for an average pane size. Larger windows may require structural mullions to reduce pane size. Intermediate muntins are assumed to be decorative and do not break up the panes. If operable, windows should open outward.

Window response and retrofits are summarized below. Also see the attached building layout sketches (Figures 4, 5, and 6) for locations of retrofit.

> *Line B and at the two "bump outs".* With the 102.6 foot standoff, the 1/4 inch laminated thermally tempered windows are determined not to crack, and therefore is over-designed. A more cost effective 1/4 inch laminated annealed glass with a minimum 5/8 inch bite will crack with no fragments flying into the room (i.e., failure response of 2), which is an acceptable failure mode.
>
> *Lines E, 1, and 21.* With the 13.4 foot standoff, the 3/4 inch laminated thermally tempered double pane windows were determined not to crack, and is also over-designed. A more cost effective design is an insulating unit comprising of an inner pane of 7/8 inch laminated thermally tempered glass, an outer pane of 1/4 inch monolithic thermally tempered glass and a 1/2 inch air space, and a minimum 5/8 inch bite. The failure mode is also 2, which is acceptable.

All window frames, mullions and anchorage are to be designed to develop the full capacity of the glass (typical, all buildings). Frames and Mullions will most likely be steel.

*4.3.2.7 Doors*

Exterior doors are to be blast resistant. The doors are allowed to fail but must rebound out of the frame away from the interior of the building. Table 7 below shows the pressures and impulses doors should resist, based on the location of the doors.

**Table 7: Pressures and Impulses for Building 356 Exterior Doors**

| Door Locations | Pressures | Impulses |
|---|---|---|
| Street side | 453.5 psi | 241.5 psi-msec |
| Short side | 93.90 psi | 79.14 psi-msec |
| Quad side | 1.96 psi | 12.29 psi-msec |

*4.3.2.8 Foundations*
The existing foundation was not analyzed for their capacity to resist air-blast loading. (See section 1.4, Limitations and Exclusions). The foundation, however, needs to have the capacity to resist the maximum lateral load that can be transferred from the exterior walls. For Building 356, this load is 11500 lbs per foot length of foundation.

*4.3.2.9 Blast Base Shear*
The blast base shear is provided for comparison with the seismic base shear. For building 356, the blast base shear is 238041 lbs.

### *4.3.3 Buildings 357*
Figures 7 and 8 graphically show the locations and extent of required retrofits as noted in the following narrative.

*4.3.3.1 Columns*
Columns were determined to survive a blast originating from the street (Foote Avenue), therefore no retrofit is required.

*4.3.3.2 Beams*
See Building 355 for description of beam failure modes and recommended retrofits.

*4.3.3.3 Slabs*
See Building 355 for description of slab failure modes and recommended retrofits

*4.3.3.4 Exterior Walls*
The construction of the exterior walls is the same as in Buildings 355 and 356. The exterior walls were analyzed in the same manner as for Building 356. The walls at Line B and at the two "bump outs" were determined to be sufficient for blast loads. Walls on Lines E, 1, and 21 will be retrofitted with new shotcrete walls. First floor walls will have 8 inch shotcrete walls, while the second and third floors will get 6 inch shotcrete walls. Reinforcements for these walls will be the same as for Building 355. See the attached building layout sketches (Figures 7 and 8), and conceptual retrofit sketch (Figure 11) for more information about the shotcrete wall.

*4.3.3.5 Roof System*
See Building 356 for description of roof system retrofit.

*4.3.3.6 Windows*
Windows were analyzed in the same manner as for Building 356. New windows on lines 1, 21, and E, are to be an insulating unit comprising of an inner pane of 1/2 inch laminated thermally tempered glass, an outer pane of 1/4 inch monolithic thermally tempered glass and a 1/2 inch air space, and a minimum 5/8 inch bite. All other locations are to receive a single pane of ¼ inch laminated annealed glass with a 5/8 inch bite. If operable, windows should open outward.

All window frames, mullions and anchorage are to be designed to develop the full capacity of the glass (typical, all buildings). Frames and Mullions will most likely be steel.

*4.3.3.7 Doors*
Exterior doors are to be blast resistant. The doors are allowed to fail but must rebound out of the frame away from the interior of the building. Table 8 below shows the pressures and impulses doors should resist, based on the location of the doors.

**Table 8: Pressures and Impulses for Building 357 Exterior Doors**

| Door Locations | Pressures | Impulses |
|---|---|---|
| Street side | 87.19 psi | 122.5 psi-msec |
| Short side | 26.74 psi | 47.44 psi-msec |
| Quad side | 2.37 psi | 14.06 psi-msec |

*4.3.3.8 Foundations*
The existing foundation was not analyzed for their capacity to resist air-blast loading. (See section 1.4, Limitations and Exclusions). The foundation, however, needs to have the capacity to resist the maximum lateral load that can be transferred from the exterior walls. For Building 357, this load is 6000 lbs per foot length of the foundation.

*4.3.3.9 Blast Base Shear*
The blast base shear is provided for comparison with the seismic base shear. For building 357, the blast base shear is 236668 lbs.

***4.3.4 Buildings 358***
Figures 9 and 10 graphically show the locations and extent of required retrofits as noted in the following narrative.

*4.3.4.1 Columns*
Columns were deemed adequate for blast loading therefore no retrofit is required.

*4.3.4.2 Beams*
See Building 355 for description of beam failure modes and recommended retrofits.

*4.3.4.3 Slabs*
See Building 355 for description of slab failure modes and recommended retrofits.

*4.3.4.4 Exterior Walls*
The construction of the exterior walls is the same as in Buildings 355, 356, and 357. The exterior walls were analyzed in the same manner as for Building 356. The walls at Line B and at the two "bump outs" were determined to be sufficient for blast loads. Walls on Lines E, 1, and 21 will be retrofitted with new shotcrete walls. All three floors will receive new 6 inch shotcrete walls, Reinforcements for these walls will be the same as for the 6 inch shotcrete walls at

Building 355. See the attached building layout sketches (Figures 9 and 10), and conceptual retrofit sketch (Figure 11) for more information about the shotcrete wall.

*4.3.4.5 Roof System*
See Building 356 for description of roof system retrofit.

*4.3.4.6 Windows*
Windows were analyzed in the same manner as for Building 356. New windows on lines 1, 21, and E, are to be an insulating unit comprising of an inner pane of 1/4 inch laminated thermally tempered glass, an outer pane of 1/4 inch monolithic thermally tempered glass and a 1/2 inch air space, and a minimum 5/8 inch bite. All other locations are to receive a single pane of 1/4 inch laminated annealed glass with a 5/8 inch bite. If operable, all windows should open outward.

All window frames, mullions and anchorage are to be designed to develop the full capacity of the glass (typical, all buildings). Frames and Mullions will most likely be steel.

*4.3.4.7 Doors*
Exterior doors are to be blast resistant. The doors are allowed to fail but must rebound out of the frame away from the interior of the building. Table 9 below shows the pressures and impulses doors should resist, based on the location of the doors.

**Table 9: Pressures and Impulses for Building 358 Exterior Doors**

| Door Locations | Pressures | Impulses |
|---|---|---|
| Street side | 27.61 psi | 73.86 psi-msec |
| Short side | 10.68 psi | 44.40 psi-msec |
| Quad side | 2.05 psi | 12.69 psi-msec |

*4.3.4.8 Foundations*
The existing foundation was not analyzed for their capacity to resist air-blast loading. (See section 1.4, Limitations and Exclusions). The foundation, however, needs to have the capacity to resist the maximum lateral load that can be transferred from the exterior walls. For Building 358, this load is 4250 lbs per foot length of the foundation.

*4.3.4.9 Blast Base Shear*
The blast base shear is provided for comparison with the seismic base shear. For building 358, the blast base shear is 226709 lbs.

## 5.0 PROGRESSIVE COLLAPSE REQUIREMENTS

Per the *Department of Defense Interim AT/FP Construction Standards Guidance on Structural Requirements*, typical scenarios were reviewed which involved removal of primary load-carrying elements at the building perimeter. The perimeter of the structure is defined as the extreme outside envelope of the building.

Structural members considered included the new shotcrete walls, which are recommended to be installed, as retrofits to increase member response to air-blast loading, at the perimeter walls for the majority of the buildings, and the exterior columns and beams at the exterior corridor. Typical members were selected for both the first floor and the upper floors.

Following the procedures in the Progressive Collapse Design guidelines, the following scenarios were reviewed:

- *Walls:* analyzed based on the removal of a section of the shear wall with a length equal to two times the height of the wall;
- *Walls:* at corner of buildings, analyzed based on the removal of a section of the shear wall with a length equal to the height of the wall;
- *Beams:* analyzed to determine the efficacy of the beams with the loss of one supporting column below; and
- *Columns:* analyzed for their ability to withstand loss of lateral support at one floor level.

## 5.1 Shotcrete Walls

Typical exterior walls were reviewed for the buildings. Per the *Department of Defense Interim AT/FP Construction Standards Guidance on Structural Requirements* (see Page 3: Load Bearing Wall Systems), a width equal to two times the wall height was removed. Also at building corners, a width of wall equal to the wall height was removed in each direction.

The wall above the removal location was analyzed to determine whether it would support self-weight as well as the weights of the slabs previously supported by the wall that was removed and the wall and slab systems above, as appropriate. The new shotcrete walls (which were recommended for blast resistance) meet the requirements.

## 5.2 Beams

Beams were analyzed at the exterior corridors of Buildings 355, 356, 357, and 358. The span length of these beams was doubled, caused by the theoretical removal of one supporting column. These beams were determined to fail due to the column removal. A new beam (23 inches deep, 15 inches wide, with 6 - #8 rebar top and bottom of beam), Figure 12, is to be installed, next to and on the inside face of the existing beam. All new beams are to be continuous over supports and doweled into the existing beams and connected to the existing columns.

## 5.3 Columns

Columns were analyzed at the exterior corridors of Buildings 355, 356, 357, and 358. The unsupported height of these columns was doubled, assuming one floor slab was disconnected from the column. These corridor columns were determined to have sufficient capacity to support all tributary dead and live loads with the increase column height.

# 6.0 REFERENCES

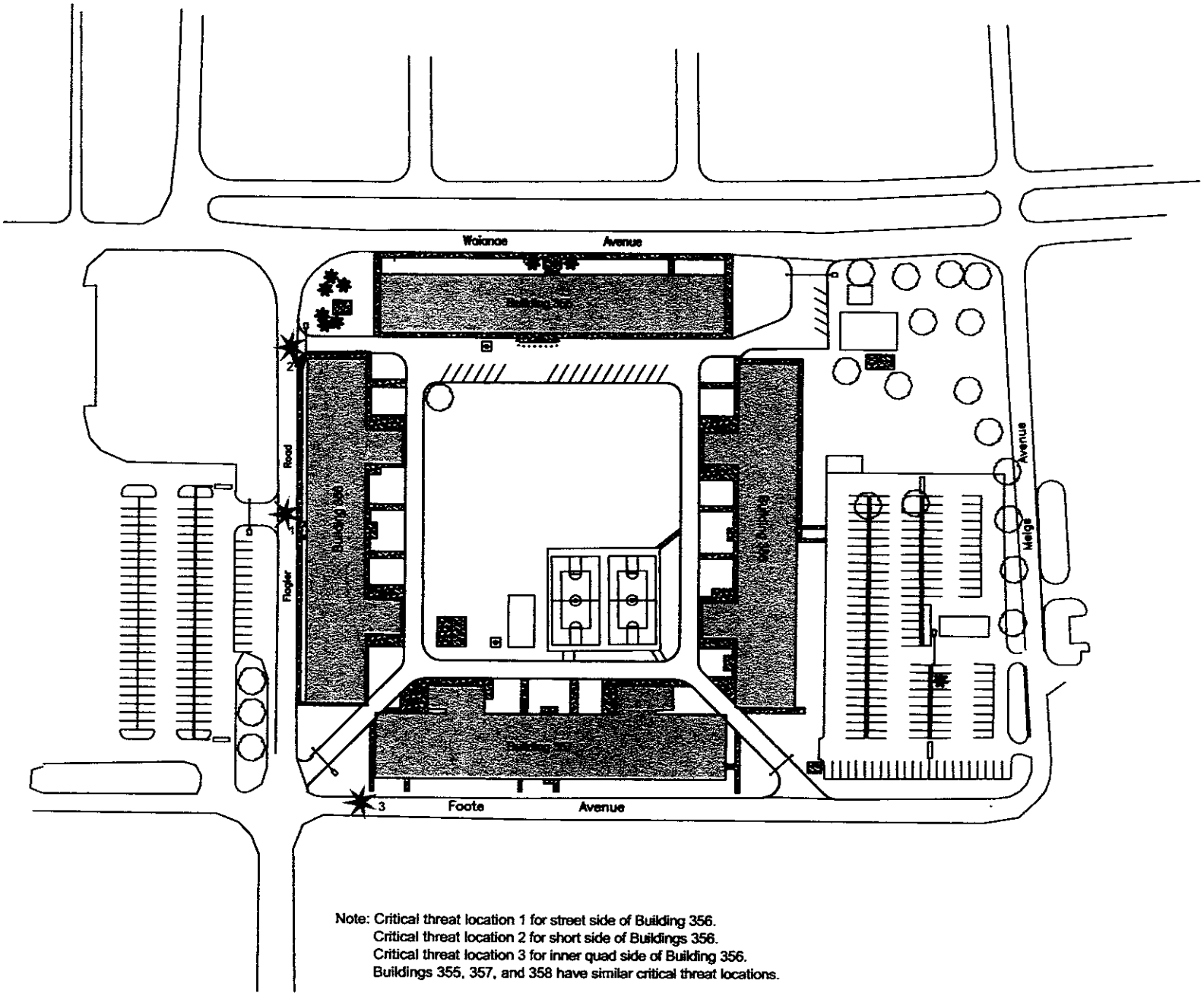
1. *Department of Defense Minimum Anti-Terrorism Standards for Buildings,* UFC 4-010-01, dated 31st July, 2002.
2. *Department of Defense Interim Anti-Terrorism/Force protection Construction Standards, Guidance on Structural Requirements,* dated 5th March, 2002.
3. *Structures to Resist the Effects of Accidental Explosions*, Army TM5-1300, Navy NAVFAC P-397, Air Force AFR 88-22, Departments of the Army, the Navy, and the Air Force, Washington, DC, November 1990.
4. *Introduction to Structural Dynamics*, Biggs, John M., McGraw Hill Book Company, New York, NY, 1964.
5. *User's Guide for Microcomputer Programs CONWEP and FUNPRO, Applications of TM5-855-1*, "Fundamentals of Protective Design For Conventional Weapons," Hyde, David W., Structures Laboratory, Department of the Army, Waterways Experiment Station, Corps of Engineers, Vicksburg, Mississippi, April 1988.
6. *Preliminary Analysis of Casualties Resulting From the Oklahoma City Bombing*, Hinman, E.E., Durkin, M. E., and Osteraas, J.D., Report No. FaAA-SF-R-96-12-20, Project No. SF23049, prepared for: The Blast Injuries Study Group, Oklahoma State Department of Health, Oklahoma City, OK, prepared by: Failure Analysis Associates, Inc., Menlo Park, CA, December 20, 1996.
7. *Window Glazing Analysis Response and Design (WINGARD) v.2.0.0.3*, Applied Research Associates for the GSA, Vicksburg, MS, August 2000.

# APPENDIX

- List of All Drawings Reviewed
- Figure 1: Site Plan and Typical Critical Threat Locations
- Figure 2: Building 355 – 1st Floor
- Figure 3: Building 355 – 2nd & 3rd Floors
- Figure 4: Building 356 – 1st Floor
- Figure 5: Building 356 – 2nd Floor
- Figure 6: Building 356 – 3rd Floor
- Figure 7: Building 357 – 1st Floor
- Figure 8: Building 357 – 2nd & 3rd Floors
- Figure 9: Building 358 – 1st Floor
- Figure 10: Building 358 – 2nd & 3rd Floors
- Figure 11: New Shotcrete Walls
- Figure 12: New Support Beam

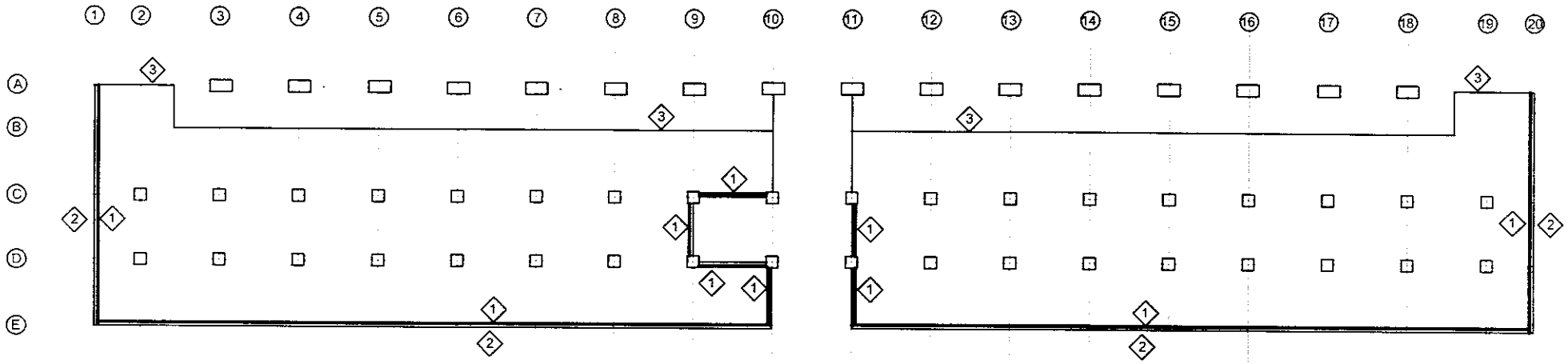
## List of All Drawings Reviewed

| Sheet Name | Job # | Sheet # | Date |
|---|---|---|---|
| Administration Building | 1454 | 1-4, 6 | Feb 1917 |
| Administration Building Floor Plans | None provided | None provided (2 sheets) | None provided |
| Barrack Building Floor Plans | H310 | 1, 2 | Feb 1918 |
| Rehabilitation of Quads Kitchen & Dining Room Floor Plans | None provided | 22 | Sept, 1951 |
| Artillery Barracks Reinforcing Details | 1477 | 7 | Nov 1917 |
| Administration Building Floor Plans | None provided | None provided | None provided |
| Infantry Admin Building | 1454-A | None provided | Sept 1915 |
| Administration Building | 1454 | 101-104 | Jan 1917 |
| Administration Building 2nd & 3rd Floor Plans | 1454 | 2<br>2 | Feb 1917<br>Dec 1918 |
| Barrack Building 1st Floor Plan | None provided | None provided | None provided |
| Infantry Barrack Building Sections & Elevations | 1478 | 5,6 | June 1917 |
| Administration Building Metal Work | 1454 | 105 | April 1917 |
| Administration Building Sections & Elevations | 1454 | 5 | Mar 1917 |
| Administration Building Floor Plans | None provided | None provided | April 1938 |
| Administration Building Floor Plans | None provided | None provided | May 1949 |
| Administration Building Exterior Elevations | None provided | 5 | April 1951 |
| Infantry Barracks Cross Section | None provided | S738 | Sept 1914 |
| Admin. & Barrack Buildings Architectural Floor Plans | None provided | None provided (12 sheets) | None provided |
| Modernization of Barracks Quads C & J and Medics Area | 9299 (Location Code) | Location Map: 1<br>Title Sheets: 1-3<br>Symbols/References: 4<br>Site Plan/Utilities: 1,2<br>Electrical Site Plan: 1<br>Arch: 1-4, 7-9, 11-28 | Dec 1973 |
| U.S. Army Engineer Division Design Branch | 9299 (Location Code) | T1-T2, C1, A1-17, S1-6 | June 2001 |



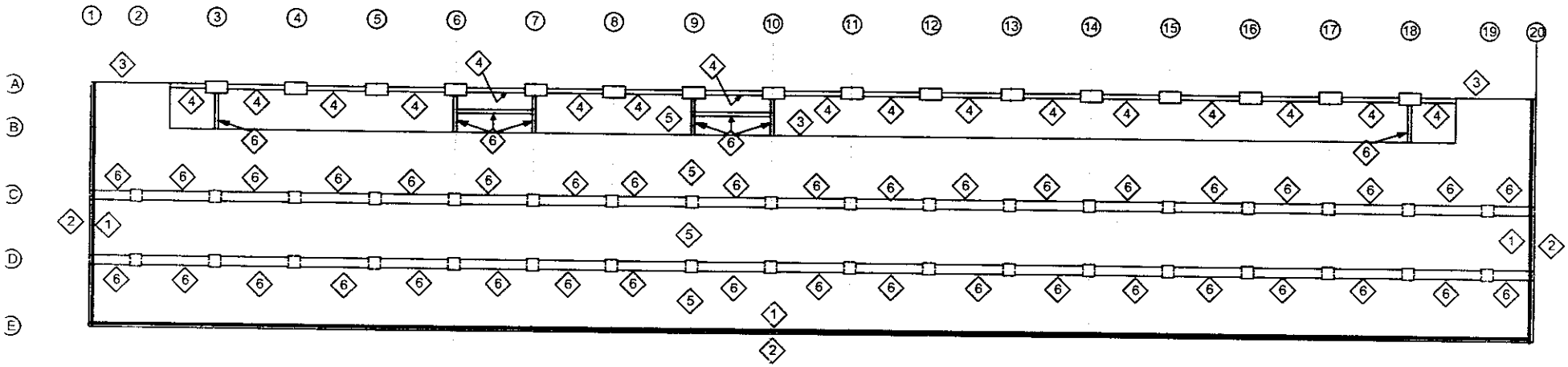

Note: Critical threat location 1 for street side of Building 356.
Critical threat location 2 for short side of Buildings 356.
Critical threat location 3 for inner quad side of Building 356.
Buildings 355, 357, and 358 have similar critical threat locations.

Figure 1: Site Plan and Typical Critical Threat Locations



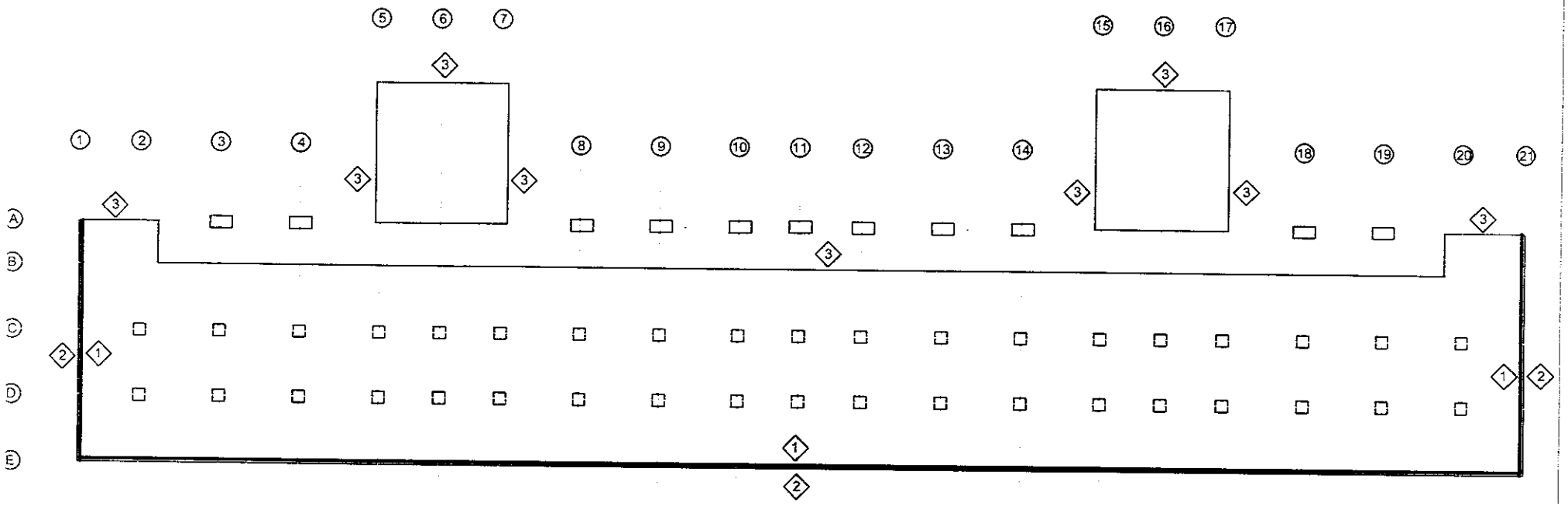

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 8" SHOTCRETE WALL | | |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ½" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| | | | |
| | | | |

Figure 2: Building 355 - 1st Floor



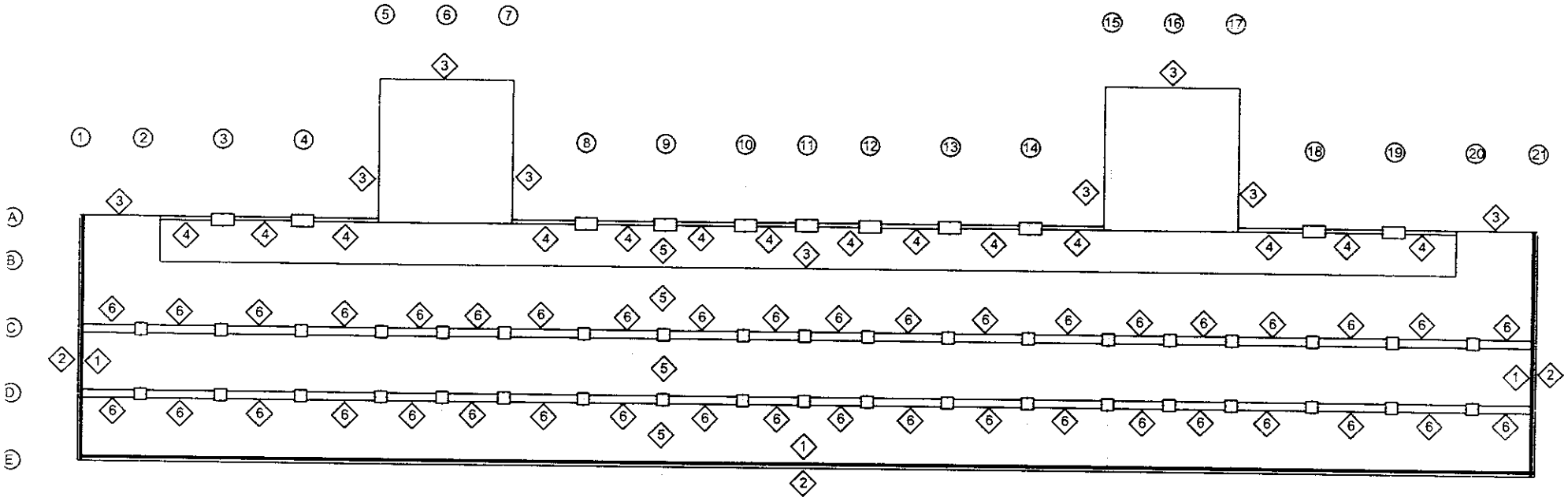

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 6" SHOTCRETE WALL | 6 | INSTALL FRP SYSTEM ON TOP OF FLOOR BEAMS<br>ATTACH STEEL PLATE TO EACH VERTICAL FACE OF INTERIOR BEAMS |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ½" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| 4 | NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM | | |
| 5 | INSTALL FRP SYSTEM OVER INTERIOR AND EXTERIOR SLABS | | |
| | | | |

Figure 3: Building 355 - 2nd & 3rd Floors



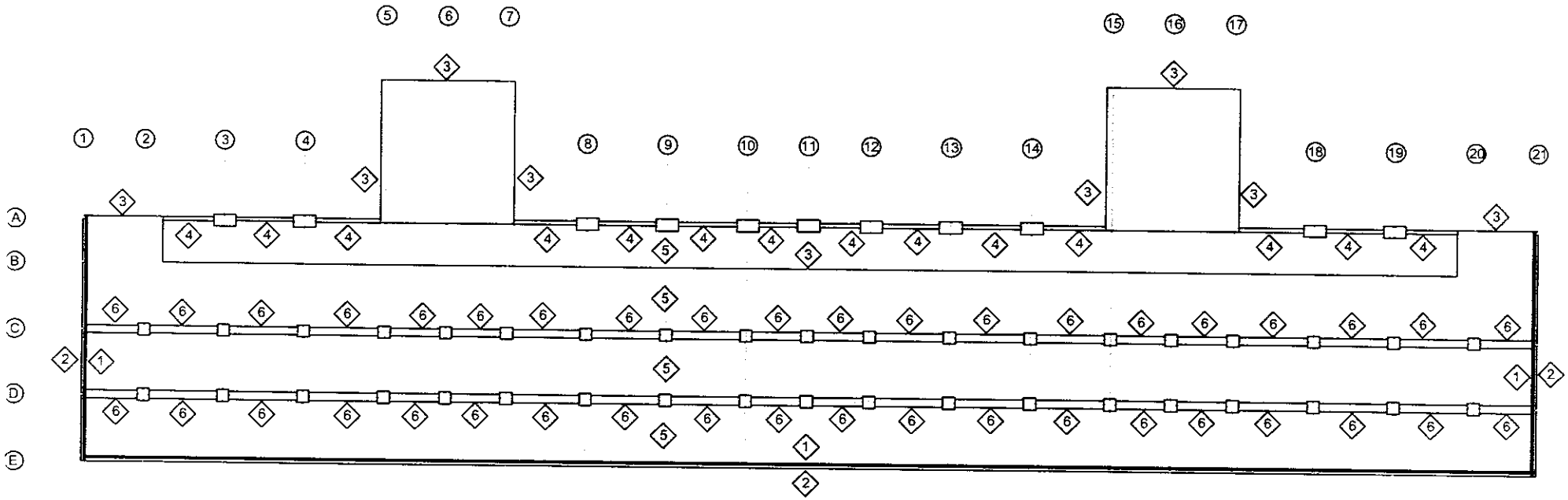

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 10" SHOTCRETE WALL | | |
| 2 | INSULATED GLASS UNIT W/ $\frac{1}{4}$" THERMAL TEMPERED OUTER LITE, $\frac{7}{8}$" LAMINATED THERMAL TEMPERED INNER LITE AND $\frac{1}{2}$" AIR GAP. | | |
| 3 | $\frac{1}{4}$" LAMINATED ANNEALED GLASS | | |
| | | | |
| | | | |

Figure 4: Building 356 - 1st Floor



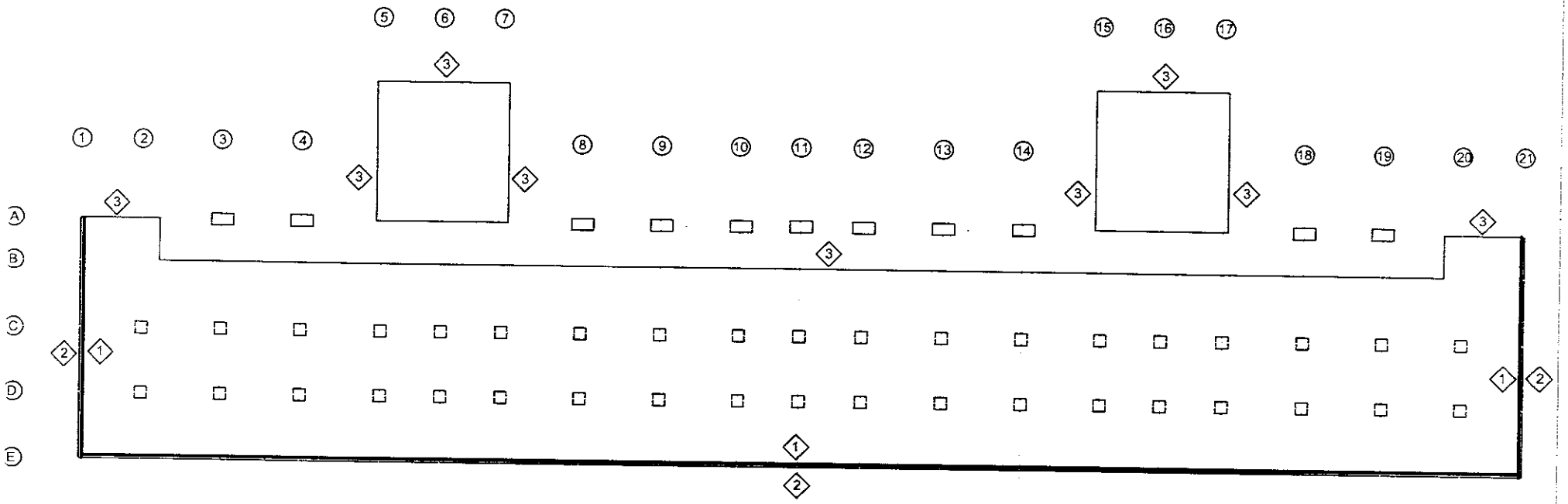

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 8" SHOTCRETE WALL | 6 | INSTALL FRP SYSTEM ON TOP OF INTERIOR BEAMS<br>ATTACH STEEL PLATE TO EACH VERTICAL FACE OF INTERIOR BEAMS |
| 2 | INSULATED GLASS UNIT W/ $\frac{1}{4}$" THERMAL TEMPERED OUTER LITE, $\frac{7}{8}$" LAMINATED THERMAL TEMPERED INNER LITE AND $\frac{1}{2}$" AIR GAP. | | |
| 3 | $\frac{1}{4}$" LAMINATED ANNEALED GLASS | | |
| 4 | NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM | | |
| 5 | INSTALL FRP SYSTEM OVER INTERIOR AND EXTERIOR SLABS | | |
| | | | |

Figure 5: Building 356 - 2nd Floor



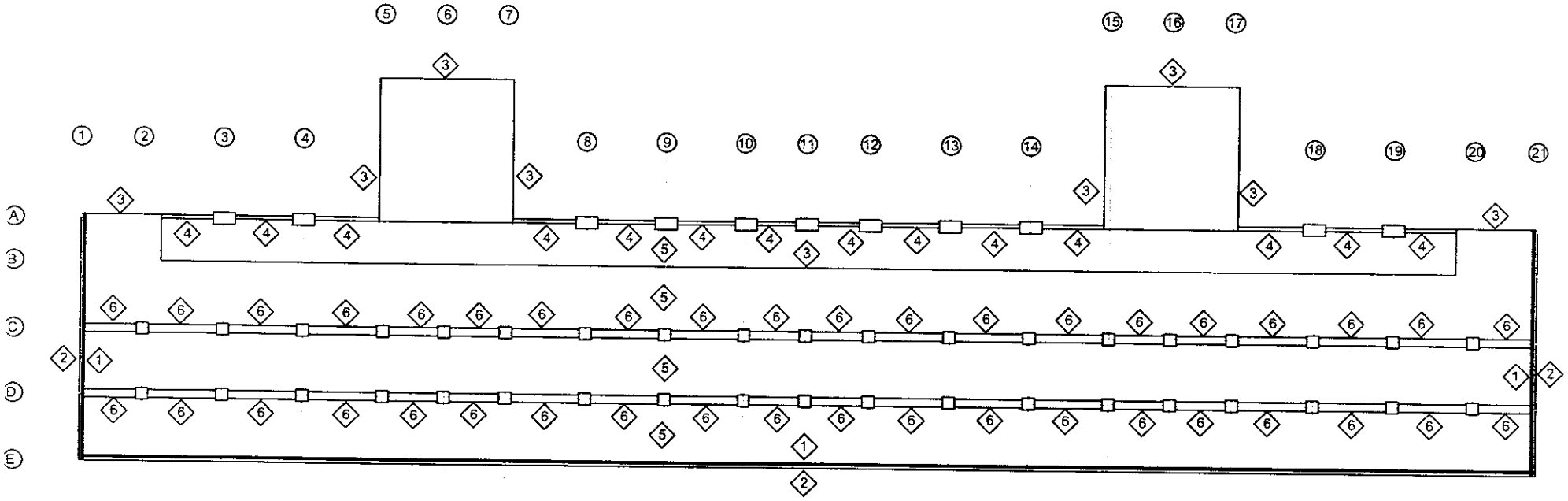

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 6" SHOTCRETE WALL | 6 | INSTALL FRP SYSTEM ON TOP OF INTERIOR BEAMS<br>ATTACH STEEL PLATE TO EACH VERTICAL FACE OF INTERIOR BEAMS |
| 2 | INSULATED GLASS UNIT W/ $\frac{1}{4}$" THERMAL TEMPERED OUTER LITE, $\frac{7}{8}$" LAMINATED THERMAL TEMPERED INNER LITE AND $\frac{1}{2}$" AIR GAP. | | |
| 3 | $\frac{1}{4}$" LAMINATED ANNEALED GLASS | | |
| 4 | NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM | | |
| 5 | INSTALL FRP SYSTEM OVER INTERIOR AND EXTERIOR SLABS | | |
| | | | |

Figure 6: Building 356 - 3rd Floor



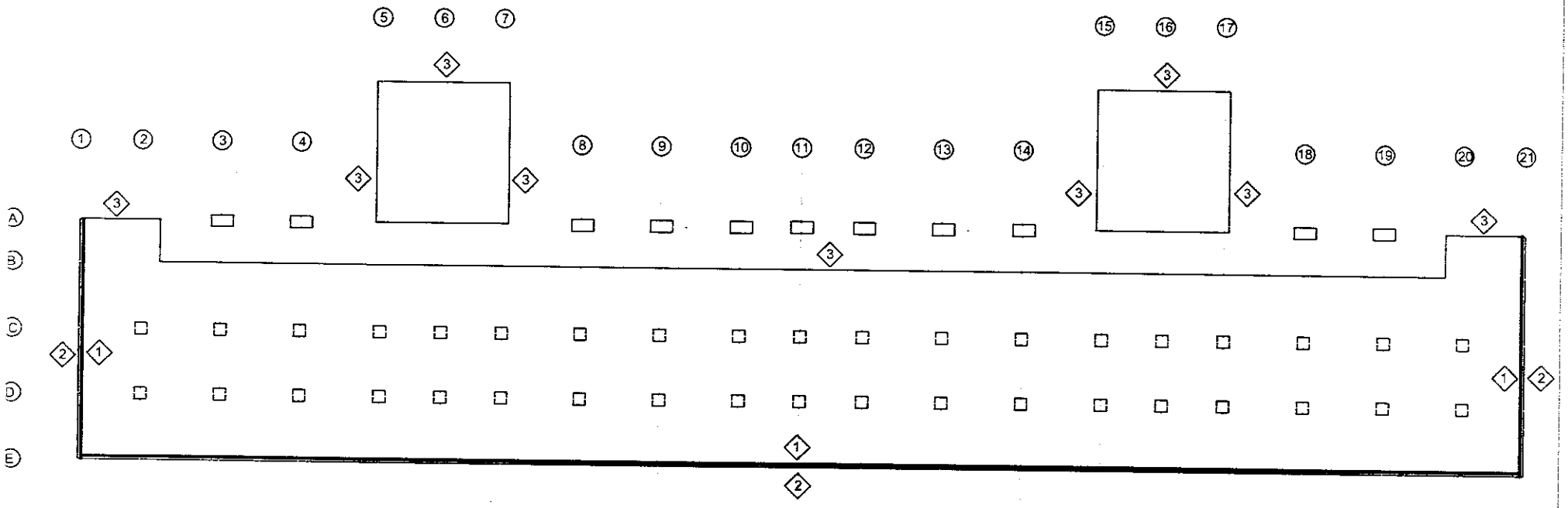

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 8" SHOTCRETE WALL | | |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ½" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| | | | |
| | | | |

Figure 7: Building 357 - 1st Floor



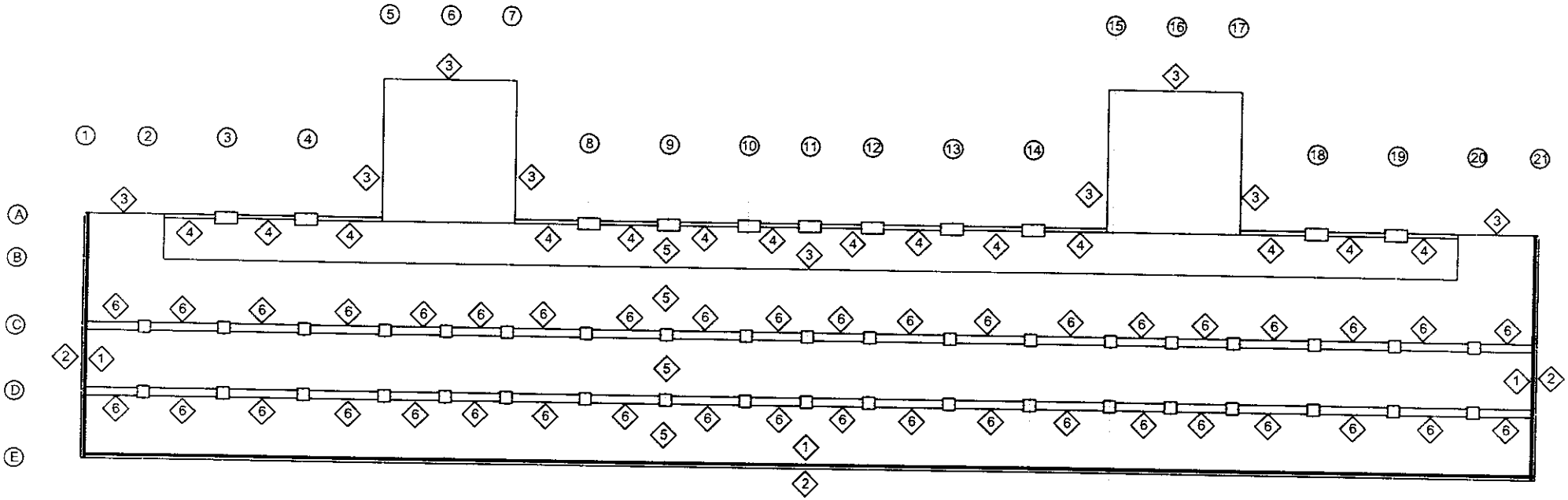

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 6" SHOTCRETE WALL | 6 | INSTALL FRP SYSTEM ON TOP OF INTERIOR BEAMS<br>ATTACH STEEL PLATE TO EACH VERTICAL FACE OF INTERIOR BEAMS |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ½" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| 4 | NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM | | |
| 5 | INSTALL FRP SYSTEM OVER INTERIOR AND EXTERIOR SLABS | | |
| | | | |

Figure 8: Building 357 - 2nd & 3rd Floors



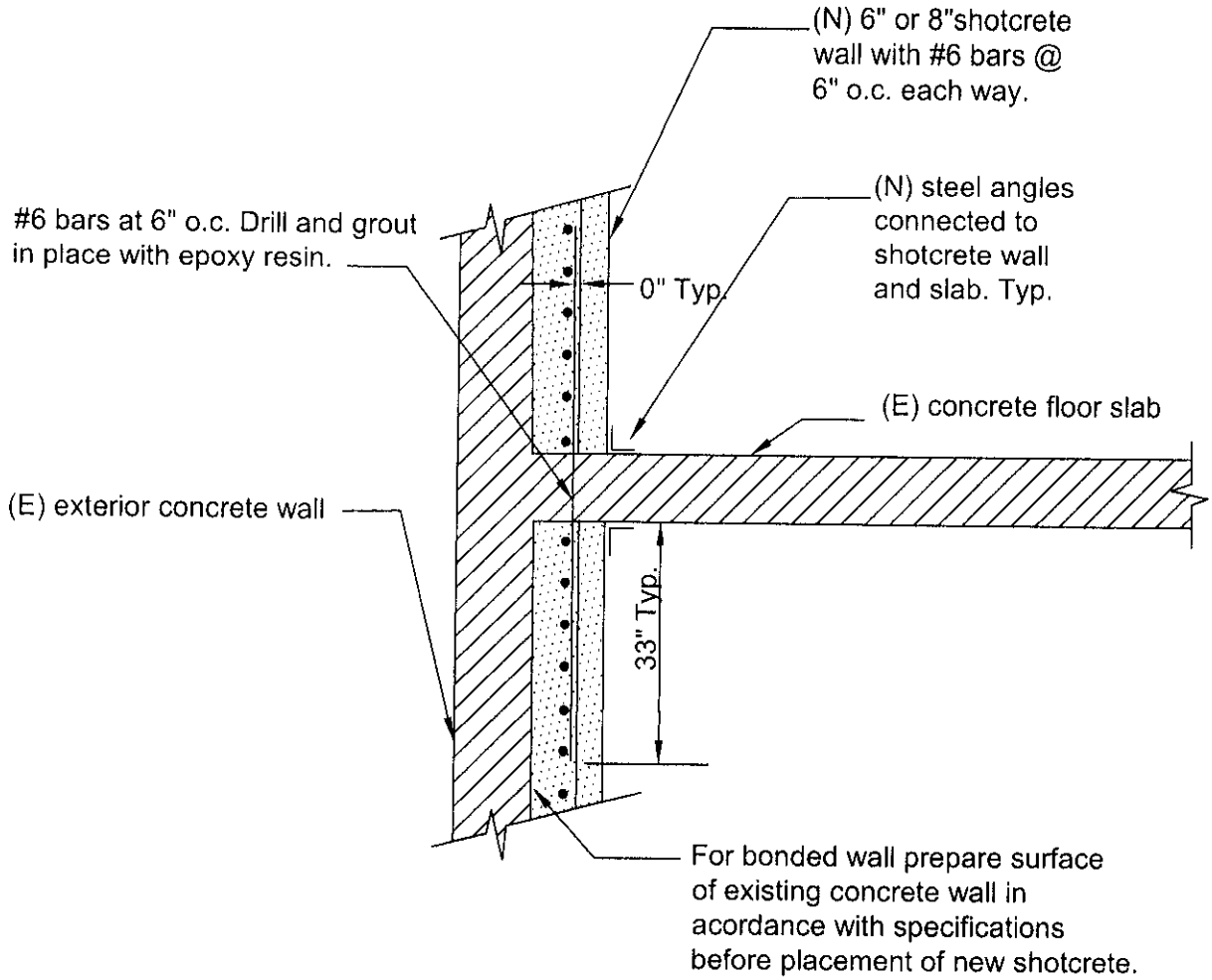

| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 6" SHOTCRETE WALL | | |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ¼" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| | | | |
| | | | |

Figure 9: Building 358 - 1st Floor




| RETROFIT UPGRADES | | | |
|---|---|---|---|
| DESIGNATION | DESCRIPTION | DESIGNATION | DESCRIPTION |
| 1 | 6" SHOTCRETE WALL | 6 | INSTALL FRP SYSTEM ON TOP OF INTERIOR BEAMS<br>ATTACH STEEL PLATE TO EACH VERTICAL FACE OF INTERIOR BEAMS |
| 2 | INSULATED GLASS UNIT W/ ¼" THERMAL TEMPERED OUTER LITE, ¼" LAMINATED THERMAL TEMPERED INNER LITE AND ½" AIR GAP. | | |
| 3 | ¼" LAMINATED ANNEALED GLASS | | |
| 4 | NEW CONCRETE BEAM ON INSIDE FACE OF EXISTING CORRIDOR BEAM | | |
| 5 | INSTALL FRP SYSTEM OVER INTERIOR AND EXTERIOR SLABS | | |
| | | | |

Figure 10: Building 358 - 2nd & 3rd Floors



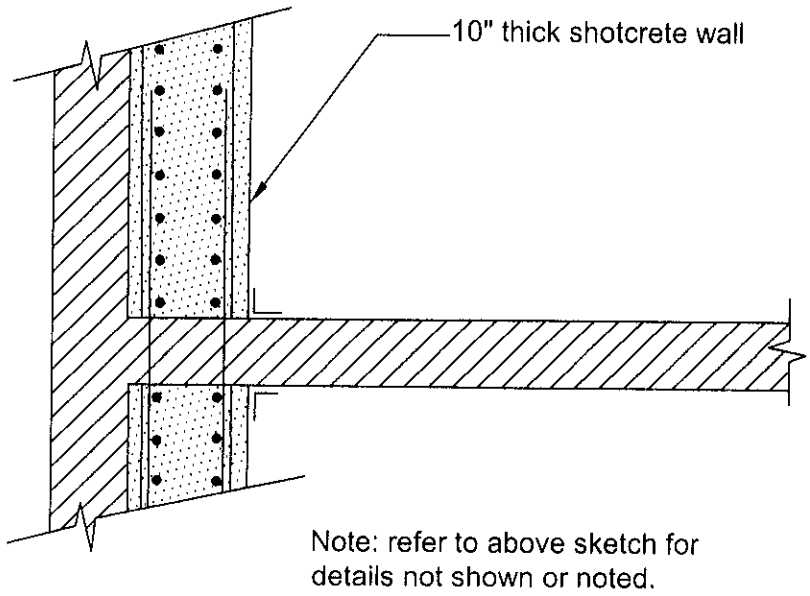




Figure 11: New Shotcrete Walls

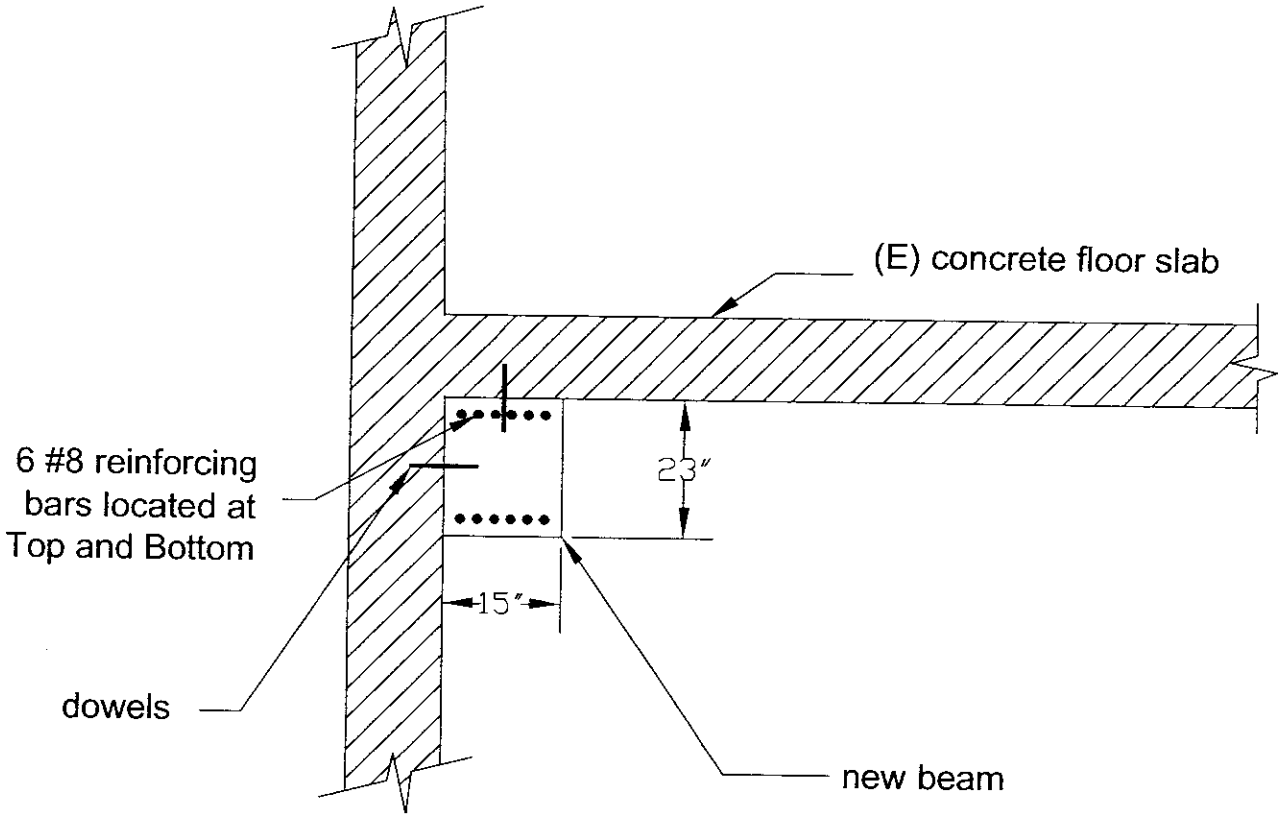



Figure 12: New Support Beam

# BUILDING CALCULATIONS

## BLAST EXISTING CONDITIONS


Beams
- Floor ..... 1
- Roof ..... 20

Columns ..... 66
Metal Deck ..... 84
Slabs ..... 92
Exterior Walls
- Building 355 ..... 104
- Building 356 ..... 122
- Building 357 ..... 137
- Building 358 ..... 140

Windows
- Building 355 ..... 155
- Building 356 ..... 163
- Building 357 ..... 171
- Building 358 ..... 179

Blast Base Shear ..... 187


## BLAST UPGRADES


Floor beam with new steel shear plates ..... 191
6" shotcrete wall next to existing exterior concrete wall ..... 196
8" shotcrete wall next to existing exterior concrete wall ..... 200
10" shotcrete wall next to existing exterior concrete wall ..... 208


## PROGRESSIVE COLLAPSE EXISTING CONDITIONS


Exterior corridor beam spanning 40 feet ..... 212
Exterior corridor column with unbraced length of 25.2 feet ..... 215
Exterior concrete wall spanning 25 feet ..... 217


## PROGRESSIVE COLLAPSE UPGRADES


Exterior corridor beam with new concrete beam spanning 40 feet ..... 233
Exterior concrete wall with new 6" shotcrete wall spanning 25 feet ..... 237


## SUMMARY OF ANALYSIS


Window Summary ..... 241
Retrofit Summary ..... 242

Schofield Barracks 3A
Building 356
2nd Floor Closer Beam H downward **NG**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 20 \cdot in$ | Existing Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 14 \cdot in$ | New Steel Yield Strength | $fy_{new} := 60000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | | |
| Slab Thickness | $t := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Slab 1 Length | $B1 := 16.83 \cdot ft$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab 2 Length | $B2 := 16.33 \cdot ft$ | Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ |
| Tension Rebar Diameter | $db_1 := 1 \cdot in$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | $db_{0.75} := 0.75 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^6 lb \cdot in^{-2}$ |

Number of PositiveTension Bars 1" Dia. $npb_1 := 6$

Number of PositiveTension Bars 3/4" Dia. $npb_{0.75} := 1$

Number of NegativeTension Bars 1" Dia. $nnb_1 := 2$

Number of NegativeTension Bars 3/4" Dia. $nnb_{0.75} := 1$

Effective Width $B := \frac{B1 + B2}{2}$ $B = 16.58\,ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Existing Steel Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800\,lb \cdot in^{-2}$ |
| Dynamic New Steel Yield Strength | $fdy_{new} := DIFs \cdot fy_{new}$ | $fdy_{new} = 70200\,lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975\,lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 5.15\,in^2$ |
| Area of Negative Steel | $As_{neg} = 2.01\,in^2$ |
| Distance to bar centroid | $yt = 1.25\,in$ |
| Distance between 2 layers of bars | $y := 1.5 \cdot in$ |

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Date 1/22/2003

| | |
|---|---|
| Effective Depths | $d = 17.25\,in$ |
| Gross Mom. of Inertia | $Ig = 9333.33\,in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 8.23\,in$ |
| Cracked Mom. of Inertia | $Ic = 6868.43\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 8100.88\,in^4$ |
| Beam Weight | $Wb = 5833.33\,lb$ |
| Slab Weight | $Ws = 24870\,lb$ |
| Live Load Weight | $WLl = 4145\,lb$ |
| Total Weight | $Wt = 34848.33\,lb$ |
| Total Mass | $M = 1083.12\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | |
|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 346747.15\,lb\,ft$ |
| Ultimate Negative Moment | $Mu_{neg} = 135396.51\,lb\,ft$ |
| Elastic Stiffness | $Ke = 1.54 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 158009.13\,lb$ (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 1.23\,in$ |
| Dead Load Displacement | $Xdl = 0.27\,in$ |

HE

Date 1/22/2003

San Francisco, California 94103

PERIOD OF VIBRATION

Load Mass Factor (TM5-1300, Table 3-12)

Period of Vibration $\omega = 42.68\,Hz$

Circular Frequency $T = 0.15\,sec$

LOAD TIME HISTORY

Incident Pressure $Ps := 13.30 \cdot psi$

Incident Impulse $Is := 35.55 \cdot psi \cdot msec$

Shock Front Velocity $U := 1490 \cdot \frac{ft}{sec}$

LUWA Reduction Factor $rf := 0.61$ (Window height= 4'-6") (Room height= 12'-1")

Reduced Pressure $Pre = 8.11\,psi$

Total Duration $td = 6.57\,msec$

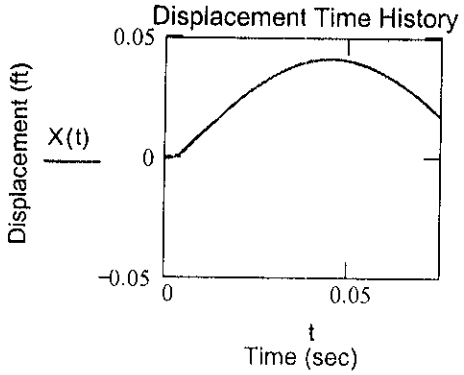
Rise Time $tr = 2.19\,msec$

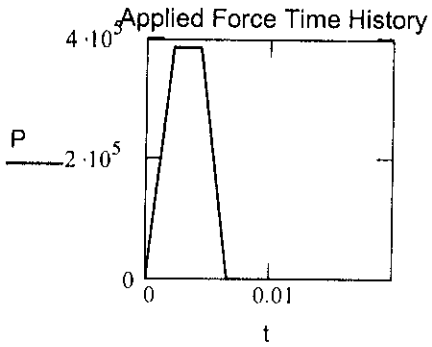
Decay Time $tp = 4.38\,msec$

Total Force $F1 = 387399\,lb$

Response Ratios $\frac{td}{T} = 0.04$ $\frac{Ru}{F1} = 0.41$

Effective Mass $Me = 844.83 \frac{lb\,sec^2}{ft}$



Dynamic Displacement $Xd = 0.5\,in$

Maximum Displacement $Xm = 0.77\,in$

Ductility $\mu = 0.51$ < 15 => ok

Max Support Rotation $\theta = 0.37\,deg$ < 2 deg => ok

SHEAR CHECK

Shear from Ru $Vu = 79004.57\,lb$

Concrete Shear Capacity $Vc = 26344.54\,lb$

Shear Ratio $\lambda v = 0.33$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (1/4"dia) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 13185.9\,lb$

Total Shear Capacity $Vn = 3.95 \times 10^4\,lb$

$\lambda = 0.5$ < 1 => No Good

CHECK BALANCED DESIGN

Ultimate Reaction from Slabs

$Mu_s := 896 \cdot lb \cdot ft$ (per 2 inch strip of interior slab width, see slab calcs)

$Mu_{slab} := Mu_s \cdot \frac{12 \cdot in}{2 \cdot in}$ $Mu_{slab} = 5376\,lb\,ft$ (per 1 ft strip of slab)

Inner Bay Slab Length $L_{in} := 16.33 \cdot ft$

Outer Bay Slab Length $L_{out} := 16.83 \cdot ft$

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From Inner Slab $Ru_{in} = 2633.68\,lb$ (per 1 ft strip of slab)

From Outer Slab $Ru_{out} = 2555.44\,lb$ (per 1 ft strip of slab)

Total Reaction $Ru_{tot} = 103782.34\,lb$

Reaction Ratio $\lambda r := \frac{Ru}{Ru_{tot}}$ $\lambda r = 1.52$ > 1 => OK

This is the closest 2nd floor H beam, and it fails in shear from Ru, but is OK for blast. This means that other 2nd floor H beams in other buildings will behave the same way (OK for blast, fail from Ru).

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
3rd Floor Closer Beam H downward **NG**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 20 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 12 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ |
| Slab 1 Length | $B1 := 16.83 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| Slab 2 Length | $B2 := 16.33 \cdot ft$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db_1 := 1 \cdot in$ | | $Ec = 2.85 \times 10^6 lb \cdot in^{-2}$ |
| | $db_{0.75} := 0.75 \cdot in$ | | |

Number of PositiveTension Bars 1" Dia. $npb_1 := 6$

Number of PositiveTension Bars 3/4" Dia. $npb_{0.75} := 1$

Number of NegativeTension Bars 1" Dia. $nnb_1 := 2$

Number of NegativeTension Bars 3/4" Dia. $nnb_{0.75} := 1$

Effective Width $B := \frac{B1 + B2}{2}$ $B = 16.58\,ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800\,lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975\,lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

Area of Positive Steel $As_{pos} = 5.15\,in^2$

Area of Negative Steel $As_{neg} = 2.01\,in^2$

Distance to bar centroid $yt = 1.25\,in$

Distance between 2 layers of bars $y := 1.5 \cdot in$

Effective Depths $d = 17.25\,in$

| | |
|---|---|
| Gross Mom. of Inertia | $Ig = 8000\,in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 8.67\,in$ |
| Cracked Mom. of Inertia | $Ic = 6467.74\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 7233.87\,in^4$ |
| Beam Weight | $Wb = 5000\,lb$ |
| Slab Weight | $Ws = 24870\,lb$ |
| Live Load Weight | $WLl = 4145\,lb$ |
| Total Weight | $Wt = 34015\,lb$ |
| Total Mass | $M = 1057.22\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 346747.15\,lb\,ft$ | |
| Ultimate Negative Moment | $Mu_{neg} = 135396.51\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 1.37 \times 10^6\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 158842.46\,lb$ | (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 1.39\,in$ | |
| Dead Load Displacement | $Xdl = 0.3\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 40.83\,Hz$ | |

Circular Frequency $T = 0.15\,sec$

LOAD TIME HISTORY

Incident Pressure $Ps := 9.412 \cdot psi$

Incident Impulse $Is := 30.53 \cdot psi \cdot msec$

Shock Front Velocity $U := 1391 \cdot \frac{ft}{sec}$

LUWA Reduction Factor $rf := 0.61$ (Window height= 4'-6") (Room height= 12'-1")

Reduced Pressure $Pre = 5.74\,psi$

Total Duration $td = 7.98\,msec$

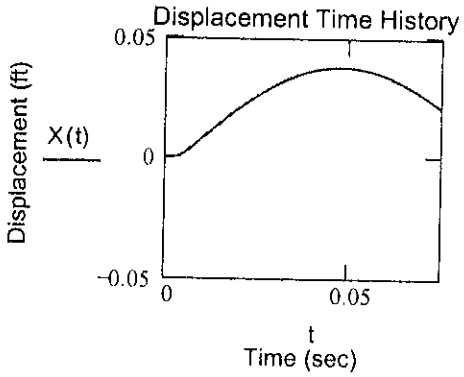
Rise Time $tr = 2.66\,msec$

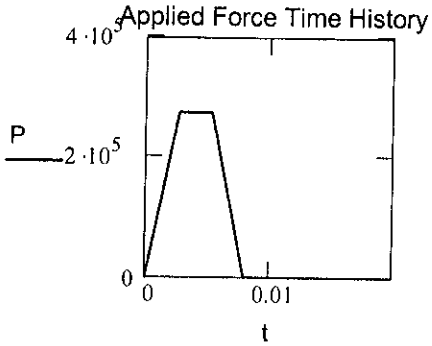
Decay Time $tp = 5.32\,msec$

Total Force $F1 = 274150.33\,lb$

Response Ratios $\frac{td}{T} = 0.05$ $\frac{Ru}{F1} = 0.58$

Effective Mass $Me = 824.63 \frac{lb\,sec^2}{ft}$



Dynamic Displacement $Xd = 0.46\,in$

Maximum Displacement $Xm = 0.75\,in$

Ductility $\mu = 0.45$ < 15 => ok

Max Support Rotation $\theta = 0.36\,deg$ < 2 deg => ok

SHEAR CHECK

Shear from Ru $Vu = 79421.23\,lb$

Concrete Shear Capacity $Vc = 22581.03\,lb$

Shear Ratio $\lambda v = 0.28$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (1/4"dia) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 13185.9\,lb$

Total Shear Capacity $Vn = 3.58 \times 10^4\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 0.45$ < 1 => No Good

CHECK BALANCED DESIGN

Ultimate Reaction from Slabs

$Mu_s := 896 \cdot lb \cdot ft$ (per 2 inch strip of interior slab width, see slab calcs)

$Mu_{slab} := Mu_s \cdot \frac{12 \cdot in}{2 \cdot in}$ $Mu_{slab} = 5376\,lb\,ft$ (per 1 ft strip of slab)

Inner Bay Slab Length $L_{in} := 16.33 \cdot ft$

Outer Bay Slab Length $L_{out} := 16.83 \cdot ft$

From Inner Slab $Ru_{in} = 2633.68\,lb$ (per 1 ft strip of slab)

From Outer Slab $Ru_{out} = 2555.44\,lb$ (per 1 ft strip of slab)

Total Reaction $Ru_{tot} = 103782.34\,lb$

Reaction Ratio $\lambda r := \frac{Ru}{Ru_{tot}}$ $\lambda r = 1.53$ > 1 => OK

This is the closest 3rd floor H beam, and it fails in shear from Ru, but is OK for blast. This means that other 3rd floor H beam in other buildings will behave the same way (OK for blast, fail from Ru).

HE

San Francisco, California 94103

Date 1/22/2003

Schofield Barracks 3A
Building 355-2nd Floor Exterior Corridor
Beam J downward **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 10.83 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 14 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.125 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 4 \cdot in$ | Live Load | $LL := 100 \cdot lb \cdot ft^{-2}$ |
| Slab 1 Length | $B1 := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| Tension Rebar Diameter | $db := 0.75 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |

$Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$

Number of PositiveTension Bars $np := 3$

Number of NegativeTension Bars $nn := 1$

Tributary Slab Width $B := 10 \cdot ft$

(Beam J is parallel to the slab span, so it won't pick up any loads from
the slab on one side of the beam. The other side has a beam framing into J, so it will pick up the slab load from that side. Therefore tributary width is only 10 ft.)

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 1.33 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.44 in^2$ |
| Distance to bar centroid | $yt = 1.75 in$ |
| Effective Depths | $d = 12.25 in$ |
| | $de = 10.5 in$ |
| Gross Mom. of Inertia | $Ig = 1829.33 in^4$ |
| Steel Percentage | $\rho = 0.01$ |
| Modular Ratio | $n = 10.18$ |

| | |
|---|---|
| Neutral Axis of Transformed Section | $kd = 4.73\,in$ |
| Cracked Mom. of Inertia | $Ic = 1080.84\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 1455.09\,in^4$ |
| Beam Weight | $Wb = 1263.5\,lb$ |
| Slab Weight | $Ws = 5415\,lb$ |
| Live Load Weight | $WLl = 2707.5\,lb$ |
| Total Weight | $Wt = 9386\,lb$ |
| Total Mass | $M = 291.73\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 54273.47\,lb\,ft$ | |
| Ultimate Negative Moment | $Mu_{neg} = 18091.16\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 1.74 \times 10^6\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 37387.07\,lb$ | (Simple-Fixed End (Downward pressure) |
| Elastic Limit Displacement | $Xe = 0.26\,in$ | |
| Dead Load Displacement | $Xdl = 0.06\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 87.48\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 2.439 \cdot psi$ |
| Incident Impulse | $Is := 14.34 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1193 \cdot \frac{ft}{sec}$ |

CHECK SHEAR

Applied Reaction $Vu = 18693.54\,lb$

Concrete Shear Capacity $Vc = 10690.54\,lb$

Shear Ratio $\lambda v = 0.57$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (1/4"dia) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 9363.9\,lb$

Total Shear Capacity $Vn = 2.01 \times 10^4\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1.07$ >1 =>OK

CHECK BALANCED DESIGN

Ultimate Reaction from Slabs

$Mu_s := 531 \cdot lb \cdot ft$ (per 2 inch strip of exterior slab width, see slab calcs)

$Mu_{slab} := Mu_s \cdot \frac{12 \cdot in}{2 \cdot in}$ $Mu_{slab} = 3186\,lb\,ft$ (per 1 ft strip of slab)

Inner Bay Slab Length $L_{in} := 16.33 \cdot ft$

Outer Bay Slab Length $L_{out} := 16.83 \cdot ft$

From Inner Slab $Ru_{in} = 1560.81\,lb$ (per 1 ft strip of slab)

From Outer Slab $Ru_{out} = 1514.44\,lb$ (per 1 ft strip of slab)

Total Reaction $Ru_{tot} = 33304.92\,lb$

Reaction Ratio $\lambda r := \frac{Ru}{Ru_{tot}}$ $\lambda r = 1.12$ > 1 => OK

HE

Date 1/22/2003

San Francisco, California 94103

s)

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
2nd Floor Exterior Corridor Beam L
Downward **OK** (3rd floor beam OK by inspection)

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 27 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.125 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 4 \cdot in$ | Live Load | $LL := 100 \cdot lb \cdot ft^{-2}$ |
| Slab 1 Length | $B1 := 10.83 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| Tension Rebar Diameter | $db := 0.75 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |

$Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$

Number of PositiveTension Bars $np := 3$

Number of NegativeTension Bars $nn := 1$

Tributary Slab Width $B := \frac{B1}{2}$ $B = 5.42 ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 1.33 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.44 in^2$ |
| Distance to bar centroid | $yt = 1.75 in$ |
| Effective Depths | $d = 25.25 in$ |
| | $de = 23.5 in$ |
| Gross Mom. of Inertia | $Ig = 9841.5 in^4$ |
| Steel Percentage | $\rho = 0.01$ |
| Modular Ratio | $n = 10.18$ |

| | |
|---|---|
| Neutral Axis of Transformed Section | $kd = 8.24\,in$ |
| Cracked Mom. of Inertia | $Ic = 5191.76\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 7516.63\,in^4$ |
| Beam Weight | $Wb = 2700\,lb$ |
| Slab Weight | $Ws = 4332\,lb$ |
| Live Load Weight | $WLl = 2166\,lb$ |
| Total Weight | $Wt = 9198\,lb$ |
| Total Mass | $M = 285.88\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | |
|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 121469.19\,lb\,ft$ |
| Ultimate Negative Moment | $Mu_{neg} = 40489.73\,lb\,ft$ |
| Elastic Stiffness | $Ke = 2.79 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 71781.46\,lb$ (Fixed Ends) |
| Elastic Limit Displacement | $Xe = 0.31\,in$ (Downward pressure) |
| Dead Load Displacement | $Xdl = 0.04\,in$ |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := .78$ (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 111.84\,Hz$ |
| Circular Frequency | $T = 0.06\,sec$ |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 2.439 \cdot psi$ |
| Incident Impulse | $Is := 14.34 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1193 \cdot \frac{ft}{sec}$ |

LUWA Reduction Factor = 1 $rf := 1.0$ (Exterior Beam: no reduction)

Reduced Pressure $Pre = 2.44\,psi$

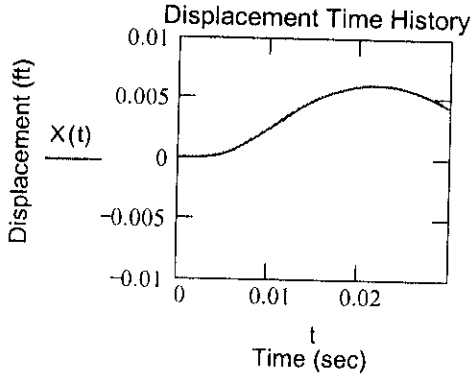
Total Duration $td = 11.76\,msec$

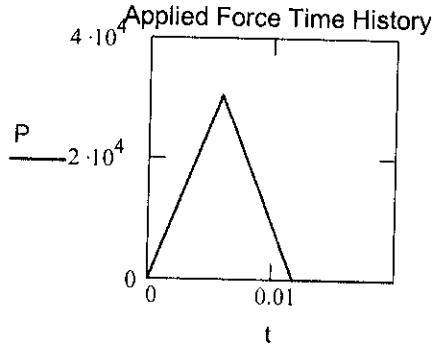
Rise Time $tr = 5.88\,msec$

Total Force $F1 = 30429.35\,lb$

Response Ratios $\frac{td}{T} = 0.21$ $\frac{Ru}{F1} = 2.36$

Effective Mass $Me = 222.99\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.07\,in$

Maximum Displacement $Xm = 0.11\,in$

Ductility $\mu = 0.33$ < 15 => ok

Max Support Rotation $\theta = 0.07\,deg$ < 2 deg => ok

CHECK SHEAR

Applied Reaction $Vu = 35890.73\,lb$

Concrete Shear Capacity $Vc = 125668.36\,lb$

Shear Ratio $\lambda v = 0.46$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (1/4"dia) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 19301.1\,lb$

Total Shear Capacity $Vn = 3.58 \times 10^4\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1$ = 1 =>OK

CHECK SHEAR FROM BLAST PRESSURE (blast pressure acting on the larger face of the beam. h=27")

Load from blast $F_b = 12643.78\,lb$

Beam is supported along its entire length by the slab. Check to make sure beam does not shear off.

Beam shear capacity $Vc = 125668.36\,lb$ $Vc > Fb$ OK

CHECK BALANCED DESIGN

Ultimate Reaction from Slabs

$Mu_s := 531 \cdot lb \cdot ft$ (per 2 inch strip of exterior slab width, see exterior slab calcs)

$Mu_{slab} := Mu_s \cdot \frac{12 \cdot in}{2 \cdot in}$ $Mu_{slab} = 3186\,lb\,ft$ (per 1 ft strip of slab)

Slab Length $L_s := 10.83 \cdot ft$

From Slab $Ru_s = 2353.46\,lb$ (per 1 ft strip of slab)

Total Reaction $Ru_{tot} = 37655.4\,lb$

Reaction Ratio $\lambda r := \frac{Ru}{Ru_{tot}}$ $\lambda r = 1.91$ > 1 => OK

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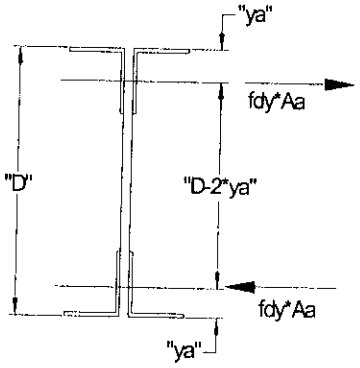
Date 1/22/2003

Schofield Barracks
Building 355
Steel Roof Joists - **OK**

| | | | | |
|---|---|---|---|---|
| Joist Length | $L := 50 \cdot ft$ | Young's Modulus | $E := 29000000 \cdot lb \cdot in^{-2}$ | $psi := lb \cdot in^{-2}$ |
| Tributary Width | $B := 20.0 \cdot ft$ | Steel Yield Strength | $fy := 36000 \cdot lb \cdot in^{-2}$ | $msec := sec \cdot 1000^{-1}$ |
| Joist Dimensions | | Joist Weight | $Wj := 30 lb \cdot ft^{-1}$ | |
| Depth | $D := 72 \cdot in$ | Concrete Weight | $Wc := 150 \cdot lb \cdot ft^{-3} \cdot 3 \cdot in$ | |
| | | | $Wc = 37.5 \frac{lb}{ft^2}$ | |

| | | | |
|---|---|---|---|
| Double Angle Dimensions | | Roof Live Load | $Wll := 20 \cdot lb \cdot ft^{-2}$ |
| Centroid | $ya := 1.26 \cdot in$ | Roof Dead Load | $Wdl := 20 \cdot lb \cdot ft^{-2}$ |
| Area | $Aa := 4.18 \cdot in^2$ | Load Mass Factor | $Klm := 0.78$ |
| Moment of Inertia | $Ia := 6.76 \cdot in^4$ | Dynamic Increase Factors | $c := 1.29$ |
| | | Avg. Strength Increase Factor | $a := 1.10$ |

| | |
|---|---|
| Incident Peak Pressure | $Pp := 4.537 \cdot psi$ |
| Incident Impulse | $I := 21.12 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1255 \cdot ft \cdot sec^{-1}$ |




| | |
|---|---|
| Total Force | $F1 = 653328 lb$ |
| Equivalent Duration | $td = 9.31 msec$ |
| Rise Time | $tr = 4.66 msec$ |
| Total Joist Area | $A = 8.36 in^2$ |
| Moment of Inertia of Joist | $I = 10102.93 in^4$ |
| Plastic Modulus | $Z = 580.85 in^3$ |

HE

Date 1/22/2003

San Francisco, California 94103

## Dynamic Response

System Weight $Wt = 64000\,lb$

System Mass $M = 1989.18\,\frac{lb\,sec^2}{ft}$

Dynamic Yield Strength $fdy = 51084\,lb\cdot in^{-2}$

Ultimate Moment $Mu = 2.47\times 10^6\,lb\,ft$

Ultimate Resistance $Ru = 331630.46\,lb$

Elastic Stiffness $K = 1.25\times 10^6\,\frac{lb}{ft}$

Elastic Limit Disp $Xe = 3.18\,in$

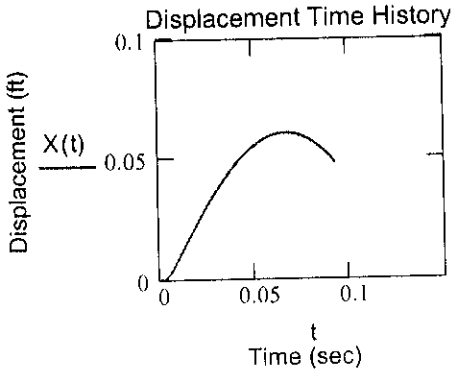
Dead Load Displacement $Xdl = 0.61\,in$

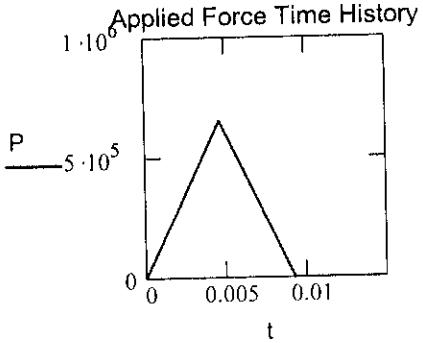
Circular Frequency $\omega = 28.38\,Hz$

Effective Mass $Me = 1551.56\,\frac{lb\,sec^2}{ft}$

Fundamental Period $T = 0.22\,sec$

Peak Load $F1 = 653328\,lb$



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Date 1/22/2003

| | | |
|---|---|---|
| Maximum Displacement | $Xm = 1.35\,in$ | |
| Ductility | $\mu = 0.35$ | <2 => ok for moderate damage |
| Max Support Rotation | $\theta = 0.26\,deg$ | < 2 deg => OK |
| Deflection to Length Ratio | $r = 445.96$ | |
| Dynamic Reaction Force | $Vd = 2.01 \times 10^5\,lb$ | |
| Static Reaction Force | $Vs = 1.66 \times 10^5\,lb$ | |
| Shear Capacity | $Vu = 2.35 \times 10^5\,lb$ | >Vd,Vs => OK |

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San Francisco, California 94103

Date 1/22/2003

Schofield Barracks 3A
Building 356,357,358
Roof Beam 10 x 45

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Steel Yield Strength | $fy := 36000 \cdot lb \cdot in^{-2}$ |
| Steel Beam Weight | $w := 45 \cdot \frac{lb}{ft}$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| X-section Area | $As := 13.3 \cdot in^2$ | Effective Width with Roof deck | $weff := 8 \cdot ft$ |
| Steel Beam Depth | $d := 10.1 \cdot in$ | Weight of Deck | $wd := 2.9 \cdot \frac{lb}{ft^2}$ |
| Web thickness | $tw := 0.35 \cdot in$ | Dead Load | $DL := 15 \cdot lb \cdot ft^{-2}$ |
| Moment of Inertia (strong axis properties) | $Ix := 248 \cdot in^4$ | Live Load | $LL := 20 \cdot lb \cdot ft^{-2}$ |
| Plastic Section Modulus | $Zx := 54.9 \cdot in^3$ | Angle of Inclination | $\theta := 14 \cdot deg$ |

DYNAMIC MATERIAL STRENGTHS

Steel Dyn. Increase Factor $a := 1.1$ $c := 1.19$ (TM5-1300 Table 5-2)

Dynamic Yield Strength $fdy := a \cdot c \cdot fy$ $fdy = 47124\, lb \cdot in^{-2}$

MODEL PROPERTIES

| | | |
|---|---|---|
| Effective Area | $Aeff = 160\, ft^2$ | |
| Total Weight | $Wt = 3200\, lb$ | |
| Total Mass | $M = 96.5 \frac{lb\, sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 215592.3\, lb\, ft$ | |
| Elastic Stiffness | $Ke = 479466.67 \frac{lb}{ft}$ | (Biggs Table 5.2) |
| Ultimate Resistance | $Ru = 83131.97\, lb$ | Simple supports with uniform load |
| Elastic Limit Displacement | $Xe = 2.08\, in$ | |
| Dead Load Displacement | $Xdl = 0.08\, in$ | |

PERIOD OF VIBRATION

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Date 1/22/2003

Load Mass Factor $Klm := 0.72$

Circular Frequency $\omega = 83.07\,Hz$

Period of Vibration $T = 0.08\,sec$

LOAD TIME HISTORY

Incident Pressure $Ps := 6.940 \cdot lb \cdot in^{-2}$

Incident Impulse $Is := 26.43 \cdot psi \cdot msec$

Shock Front Velocity $U := 1324 \cdot \frac{ft}{sec}$

Rise Time $tr = 15.11\,msec$

Scaled Duration $td = 22.72\,msec$

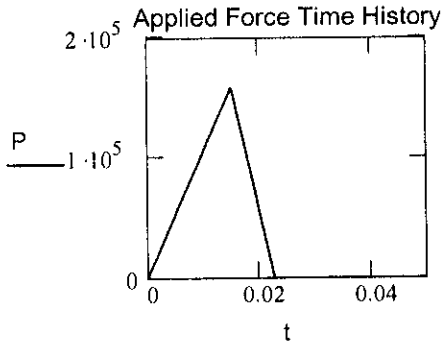
Total Force $F1 = 1.6 \times 10^5\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.3$ $\frac{Ru}{F1} = 0.52$

Equivalent Mass $Me = 69.48 \frac{lb\,sec^2}{ft}$

Applied Load




RESULTS

Dynamic Displacement $Xd = 3.98\,in$

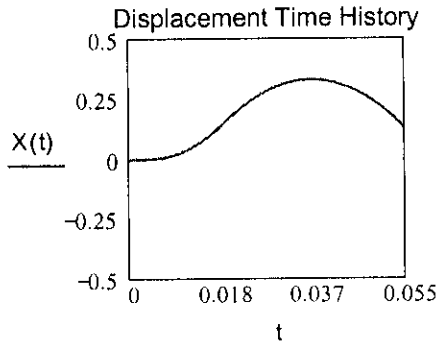
Maximum Displacement $Xm = 4.05\,in$

Peak Support Rotation $\theta = 1.93\,deg$ less than 2 ok

Ductility $\mu = 1.88$ < 10 => OK

Deflection to Span Ratio $\lambda d = 0.017$

per FACEDAP manual, w/l < 0.04
equiv to Low Level of Protection - OK




SHEAR DESIGN



LIMITED OFFICIAL USE

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Date 1/22/2003

Steel Shear Capacity $Vu = 9.16 \times 10^4 \, lb$

Static Shear Reaction $V = 4.16 \times 10^4 \, lb$

Shear Check $\lambda = 2.2$ > 1 => OK

CHECK OF DECK CAPACITY VERSUS BEAM CAPACITY

Span of Deck $sb := 5.5 \cdot ft$

Deck Resistance $rp := 5452 \cdot \frac{lb}{ft}$

Load from Deck to Beam $Rp = 109040 \, lb$

Load Ratio $\lambda l = 0.76$ > 1 => OK

CONNECTION LOADS

Connection load $Pconn = 4.17 \times 10^4 \, lb$

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Date 1/22/2003

Schofield Barracks 3A
Building 356,357,358
Roof Beam 12 x 79

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Steel Yield Strength | $fy := 36000 \cdot lb \cdot in^{-2}$ |
| Steel Beam Weight | $w := 79 \cdot \frac{lb}{ft}$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| X-section Area | $As := 23.2 \cdot in^2$ | Effective Width with Roof deck | $w_{eff} := 20 \cdot ft$ |
| Steel Beam Depth | $d := 12.38 \cdot in$ | Weight of Deck | $wd := 2.9 \cdot \frac{lb}{ft^2}$ |
| Web thickness | $tw := 0.47 \cdot in$ | Dead Load | $DL := 15 \cdot lb \cdot ft^{-2}$ |
| Moment of Inertia (strong axis properties) | $Ix := 662 \cdot in^4$ | Live Load | $LL := 20 \cdot lb \cdot ft^{-2}$ |
| Plastic Section Modulus | $Zx := 119 \cdot in^3$ | Angle of Inclination | $\theta := 14 \cdot deg$ |

DYNAMIC MATERIAL STRENGTHS

Steel Dyn. Increase Factor $a := 1.1$ $c := 1.19$ (TM5-1300 Table 5-2)

Dynamic Yield Strength $fdy := a \cdot c \cdot fy$ $fdy = 47124\, lb \cdot in^{-2}$

MODEL PROPERTIES

| | | |
|---|---|---|
| Effective Area | $Aeff = 400\, ft^2$ | |
| Total Weight | $Wt = 8000\, lb$ | |
| Total Mass | $M = 241.26 \frac{lb\, sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 467313\, lb\, ft$ | |
| Elastic Stiffness | $Ke = 1.28 \times 10^6 \frac{lb}{ft}$ | (Biggs Table 5.2) |
| Ultimate Resistance | $Ru = 179162.83\, lb$ | Simple supports with uniform load |
| Elastic Limit Displacement | $Xe = 1.68\, in$ | |
| Dead Load Displacement | $Xdl = 0.07\, in$ | |

PERIOD OF VIBRATION

Load Mass Factor $Klm := 0.72$

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Date 1/22/2003

Circular Frequency $\omega = 85.84\,\text{Hz}$

Period of Vibration $T = 0.07\,\text{sec}$

LOAD TIME HISTORY

Incident Pressure $Ps := 6.940 \cdot lb \cdot in^{-2}$

Incident Impulse $Is := 26.43 \cdot psi \cdot msec$

Shock Front Velocity $U := 1324 \cdot \frac{ft}{sec}$

Rise Time $tr = 15.11\,\text{msec}$

Scaled Duration $td = 22.72\,\text{msec}$

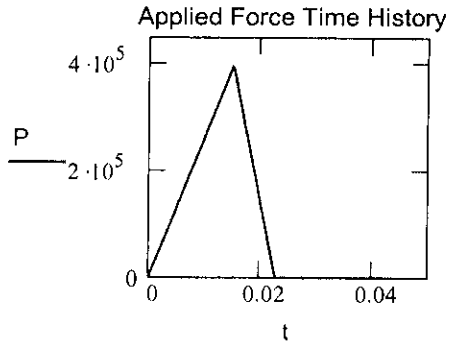
Total Force $F1 = 4 \times 10^5\,\text{lb}$

RESPONSE

Response Ratios $\frac{td}{T} = 0.31$ $\frac{Ru}{F1} = 0.45$

Equivalent Mass $Me = 173.71\,\frac{lb\,sec^2}{ft}$

Applied Load




RESULTS

Dynamic Displacement $Xd = 4.21\,\text{in}$

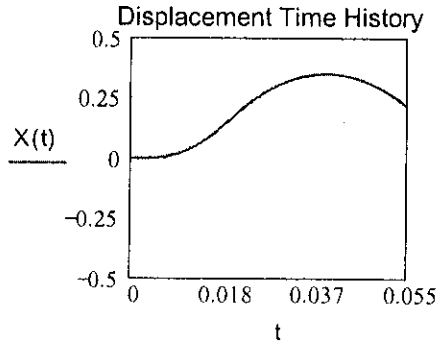
Maximum Displacement $Xm = 4.29\,\text{in}$

Peak Support Rotation $\theta = 2.05\,\text{deg}$ about 2 OK

Ductility $\mu = 2.45$ < 10 => OK

Deflection to Span Ratio $\lambda d = 0.018$

per FACEDAP manual, w/l < 0.04
equiv to Low Level of Protection - OK



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Date 1/22/2003

SHEAR DESIGN

Steel Shear Capacity $Vu = 1.51 \times 10^5 \, lb$

Static Shear Reaction $V = 8.96 \times 10^4 \, lb$

Shear Check $\lambda = 1.68$ > 1 => OK

CHECK OF DECK CAPACITY VERSUS BEAM CAPACITY

Span of Deck $sb := 5.5 \cdot ft$

Deck Resistance $rp := 5452 \cdot \frac{lb}{ft}$

Load from Deck to Beam $Rp = 109040 \, lb$

Load Ratio $\lambda l = 1.64$ > 1 => OK

CONNECTION LOADS

Connection load $Pconn = 4.17 \times 10^4 \, lb$

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Date 1/22/2003

Schofield Barracks 3A
Building 356
Roof Beam A downward **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Tributary Width | $B := 16.58 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |

| | | |
|---|---|---|
| Neutral Axis of Transformed Section | $kd = 2.71\,in$ | |
| Cracked Mom. of Inertia | $Ic = 323.14\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 578.24\,in^4$ | |
| Beam Weight | $Wb = 2083.33\,lb$ | |
| Live Load Weight | $WLl = 0\,lb$ | |
| Total Weight | $Wt = 2083.33\,lb$ | |
| Total Mass | $M = 64.75\,\frac{lb\,sec^2}{ft}$ | |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 19909.84\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 14932.38\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 109865.03\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 11853.56\,lb$ | (Fixed Ends) |
| Elastic Limit Displacement | $Xe = 1.29\,in$ | (Downward pressure) |
| Dead Load Displacement | $Xdl = 0.23\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 46.64\,Hz$ | |
| Circular Frequency | $T = 0.13\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.45 \cdot psi$ |
| Incident Impulse | $Is := 25.48 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1310 \cdot \frac{ft}{sec}$ |

HE

San Francisco, California 94103

Date 1/22/2003

LUWA Reduction Factor $rf := 0.75$

(Window height= 6'-6")

(Room height= 12'-1")

Reduced Pressure $Pre = 4.84\,psi$

Total Duration $td = 7.9\,msec$

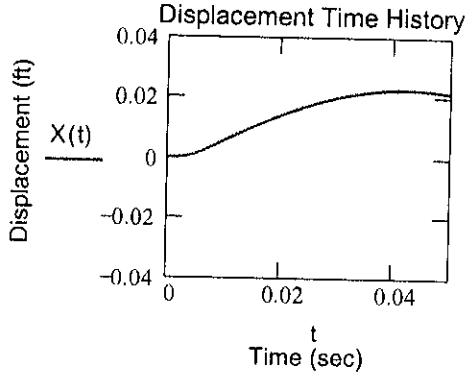
Rise Time $tr = 2.63\,msec$

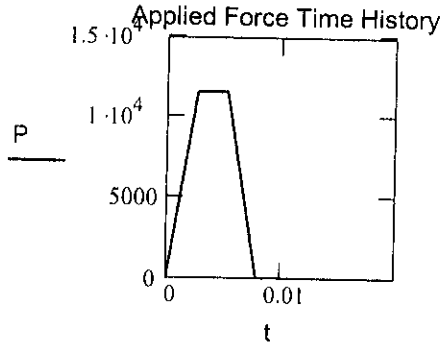
Decay Time $tp = 5.27\,msec$

Total Force $F1 = 11610\,lb$

Response Ratios $\frac{td}{T} = 0.06$ $\frac{Ru}{F1} = 1.02$

Effective Mass $Me = 50.51\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.27\,in$

Maximum Displacement $Xm = 0.5\,in$

Ductility $\mu = 0.33$ < 15 => ok

Max Support Rotation $\theta = 0.24\,deg$ < 2 deg => ok

SHEAR CHECK

Applied Reaction $Vu = 5926.78\,lb$

Shear from blast $Vb = 5805\,lb$

Concrete Shear Capacity $Vc = 8999.69\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 1.52$ > 1 => stirrups not required, but provided

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
Roof Beam A upward **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Tributary Width | $B := 16.58 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |

| | | |
|---|---|---|
| Neutral Axis of Transformed Section | $kd = 2.35\,in$ | |
| Cracked Mom. of Inertia | $Ic = 260.63\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 546.98\,in^4$ | |
| Beam Weight | $Wb = 2083.33\,lb$ | |
| Live Load Weight | $WLl = 0\,lb$ | |
| Total Weight | $Wt = 2083.33\,lb$ | |
| Total Mass | $M = 64.75\,\frac{lb\,sec^2}{ft}$ | |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 14932.38\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 14932.38\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 103926.24\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 14029.24\,lb$ | (Fixed Ends) |
| Elastic Limit Displacement | $Xe = 1.62\,in$ | (Upward pressure) |
| Dead Load Displacement | $Xdl = 0.24\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 45.36\,Hz$ | |
| Circular Frequency | $T = 0.14\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.45 \cdot psi$ |
| Incident Impulse | $Is := 25.48 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1310 \cdot \frac{ft}{sec}$ |

HE

San Francisco, California 94103

Date 1/22/2003

LUWA Reduction Factor $rf := 0.75$

(Window height= 6'-6")

(Room height= 12'-1")

Reduced Pressure $Pre = 4.84\,psi$

Total Duration $td = 7.9\,msec$

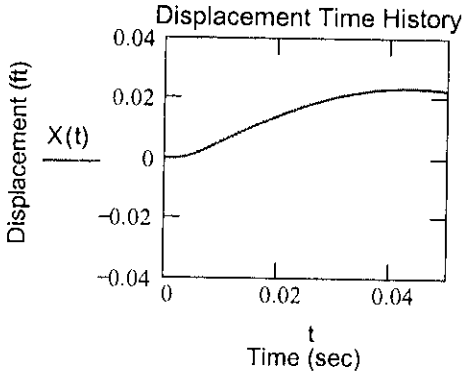
Rise Time $tr = 2.63\,msec$

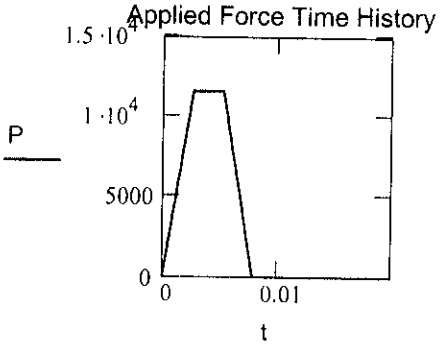
Decay Time $tp = 5.27\,msec$

Total Force $F1 = 11610\,lb$

Response Ratios $\frac{td}{T} = 0.06$ $\frac{Ru}{F1} = 1.21$

Effective Mass $Me = 50.51\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.28\,in$

Maximum Displacement $Xm = 0.04\,in$

Ductility $\mu = 0.03$ < 15 => ok

Max Support Rotation $\theta = 0.02\,deg$ < 2 deg => ok

SHEAR CHECK

Applied Reaction $Vu = 7014.62\,lb$

Shear from blast $Vb = 5805\,lb$

Concrete Shear Capacity $Vc = 8999.69\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 1.28$ > 1 => stirrups not required, but still provided

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
Roofr Beam C downward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16.83 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ (no slab) |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |

| | |
|---|---|
| Neutral Axis of Transformed Section | $kd = 2.71\,in$ |
| Cracked Mom. of Inertia | $Ic = 323.14\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 578.24\,in^4$ |
| Beam Weight | $Wb = 1753.12\,lb$ |
| Live Load Weight | $WLl = 0\,lb$ |
| Total Weight | $Wt = 1753.12\,lb$ |
| Total Mass | $M = 54.49\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 19909.84\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 14932.38\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 184372.92\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 14808.84\,lb$ | (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 0.96\,in$ | |
| Dead Load Displacement | $Xdl = 0.11\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 65.86\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 9.315 \cdot psi$ |
| Incident Impulse | $Is := 30.39 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1388 \cdot \frac{ft}{sec}$ |

LUWA Reduction Factor $rf := 0.75$

(Window height= 6'-6")

(Room height= 12'-1")

Reduced Pressure $Pre = 6.99\,psi$

Total Duration $td = 6.52\,msec$

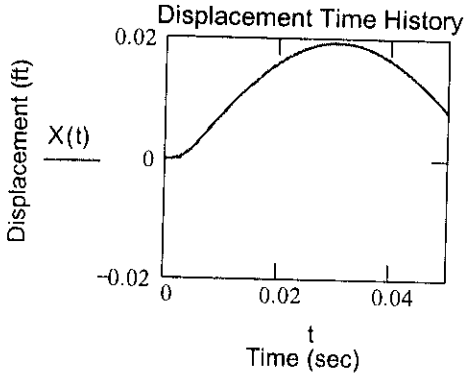
Rise Time $tr = 2.17\,msec$

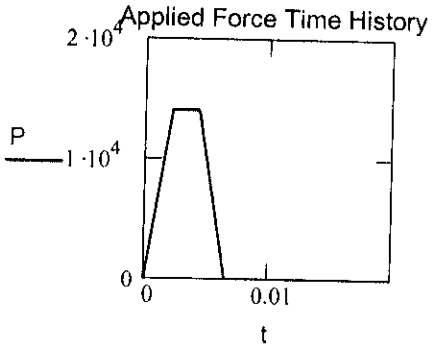
Decay Time $tp = 4.35\,msec$

Total Force $F1 = 14109.43\,lb$

Response Ratios $\frac{td}{T} = 0.07$ $\frac{Ru}{F1} = 1.05$

Effective Mass $Me = 42.5\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.23\,in$

Maximum Displacement $Xm = 0.35\,in$

Ductility $\mu = 0.32$ < 15 => ok

Max Support Rotation $\theta = 0.2\,deg$ < 2 deg => ok

SHEAR CHECK

Shear from Ru $Vu = 7404.42\,lb$

Shear from blast $Vb = 7054.72\,lb$

Concrete Shear Capacity $Vc = 8999.69\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 1.22$ > 1 => stirrups not required, but provided

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
Roofr Beam C upward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16.83 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ (no slab) |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |

HE

San Francisco, California 94103

Date 1/22/2003

| | | |
|---|---|---|
| Modular Ratio | $n = 10.18$ | |
| Neutral Axis of Transformed Section | $kd = 2.35\,in$ | |
| Cracked Mom. of Inertia | $Ic = 260.63\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 546.98\,in^4$ | |
| Beam Weight | $Wb = 1753.12\,lb$ | |
| Live Load Weight | $WLl = 0\,lb$ | |
| Total Weight | $Wt = 1753.12\,lb$ | |
| Total Mass | $M = 54.49\,\frac{lb\,sec^2}{ft}$ | |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 14932.38\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 19909.84\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 174406.58\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 18315.09\,lb$ | (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 1.26\,in$ | |
| Dead Load Displacement | $Xdl = 0.12\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 64.06\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

HE

Date 1/22/2003

San Francisco, California 94103

LOAD TIME HISTORY

Incident Pressure $Ps := 9.315 \cdot psi$

Incident Impulse $Is := 30.39 \cdot psi \cdot msec$

Shock Front Velocity $U := 1388 \cdot \frac{ft}{sec}$

LUWA Reduction Factor $rf := 0.75$ (Window height= 6'-6") (Room height= 12'-1")

Reduced Pressure $Pre = 6.99\,psi$

Total Duration $td = 6.52\,msec$

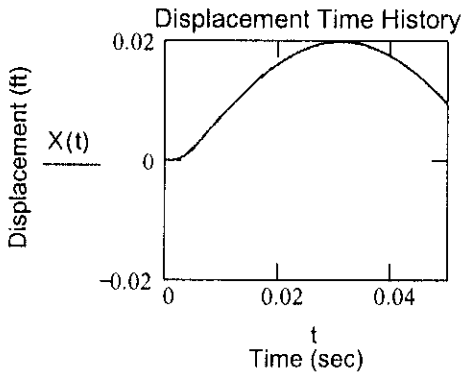
Rise Time $tr = 2.17\,msec$

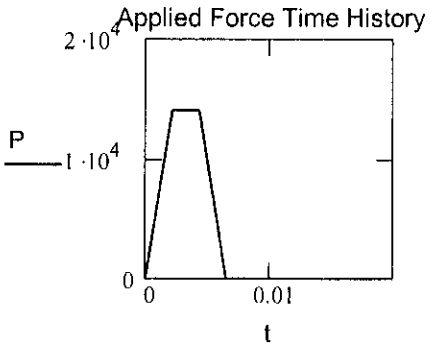
Decay Time $tp = 4.35\,msec$

Total Force $F1 = 14109.43\,lb$

Response Ratios $\frac{td}{T} = 0.07$ $\frac{Ru}{F1} = 1.3$

Effective Mass $Me = 42.5 \frac{lb\,sec^2}{ft}$



| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.24\,in$ | |
| Maximum Displacement | $Xm = 0.12\,in$ | |
| Ductility | $\mu = 0.1$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.07\,deg$ | < 2 deg => ok |

SHEAR CHECK

| | | | |
|---|---|---|---|
| Shear from Ru | | $Vu = 9157.54\,lb$ | |
| Shear from blast | | $Vb = 7054.72\,lb$ | |
| Concrete Shear Capacity | | $Vc = 8999.69\,lb$ | |
| Shear Ratio | $\lambda v := \frac{Vc}{Vu}$ | $\lambda v = 0.98$ | > 1 => stirrups not required, but provided |

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
Roofr Beam D downward **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16.33 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |

| | | |
|---|---|---|
| Modular Ratio | $n = 10.18$ | |
| Neutral Axis of Transformed Section | $kd = 2.71\,in$ | |
| Cracked Mom. of Inertia | $Ic = 323.14\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 578.24\,in^4$ | |
| Beam Weight | $Wb = 1701.04\,lb$ | |
| Live Load Weight | $WLl = 0\,lb$ | |
| Total Weight | $Wt = 1701.04\,lb$ | |
| Total Mass | $M = 52.87\,\frac{lb\,sec^2}{ft}$ | |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 19909.84\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 14932.38\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 201832.42\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 15368.02\,lb$ | (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 0.91\,in$ | |
| Dead Load Displacement | $Xdl = 0.1\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 69.96\,Hz$ | |
| Circular Frequency | $T = 0.09\,sec$ | |

HE

Date 1/22/2003

San Francisco, California 94103

LOAD TIME HISTORY

Incident Pressure $Ps := 9.315 \cdot psi$

Incident Impulse $Is := 30.39 \cdot psi \cdot msec$

Shock Front Velocity $U := 1388 \cdot \frac{ft}{sec}$

LUWA Reduction Factor $rf := 0.75$

(Window height= 6'-6")

(Room height= 12'-1")

Reduced Pressure $Pre = 4.84\,psi$

Total Duration $td = 7.9\,msec$

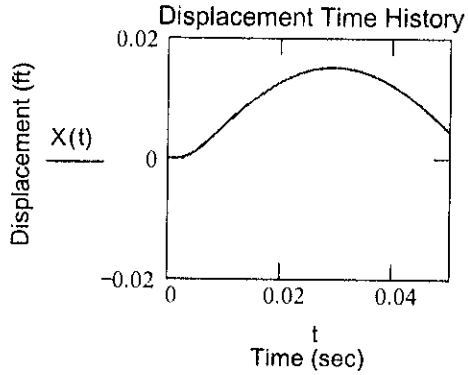
Rise Time $tr = 2.63\,msec$

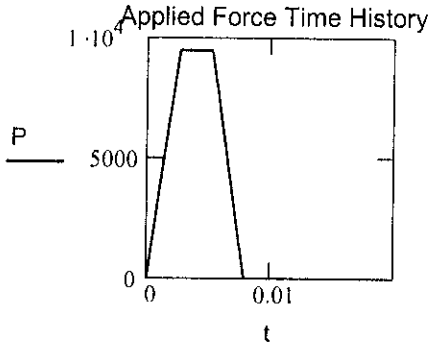
Decay Time $tp = 5.27\,msec$

Total Force $F1 = 9479.57\,lb$

Response Ratios $\frac{td}{T} = 0.09$ $\frac{Ru}{F1} = 1.62$

Effective Mass $Me = 41.24 \frac{lb\,sec^2}{ft}$



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San Francisco, California 94103

| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.18\,in$ | |
| Maximum Displacement | $Xm = 0.28\,in$ | |
| Ductility | $\mu = 0.28$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.17\,deg$ | < 2 deg => ok |

SHEAR CHECK

| | | | |
|---|---|---|---|
| Shear from Ru | | $Vu = 7684.01\,lb$ | |
| Shear from blast | | $Vb = 4739.78\,lb$ | |
| Concrete Shear Capacity | | $Vc = 8999.69\,lb$ | |
| Shear Ratio | $\lambda v := \frac{Vc}{Vu}$ | $\lambda v = 1.17$ | > 1 => stirrups not required, but provided |

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356
Roofr Beam D upward **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16.33 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |

| | |
|---|---|
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 2.35\,in$ |
| Cracked Mom. of Inertia | $Ic = 260.63\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 546.98\,in^4$ |
| Beam Weight | $Wb = 1701.04\,lb$ |
| Live Load Weight | $WLl = 0\,lb$ |
| Total Weight | $Wt = 1701.04\,lb$ |
| Total Mass | $M = 52.87\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 14932.38\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 19909.84\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 190922.3\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 18770.11\,lb$ | (Fixed Ends) (Upward pressure) |
| Elastic Limit Displacement | $Xe = 1.18\,in$ | |
| Dead Load Displacement | $Xdl = 0.11\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 68.04\,Hz$ | |
| Circular Frequency | $T = 0.09\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.45 \cdot psi$ |
| Incident Impulse | $Is := 25.48 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1310 \cdot \frac{ft}{sec}$ |

HE

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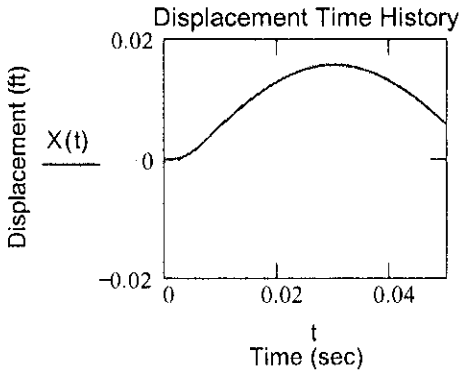
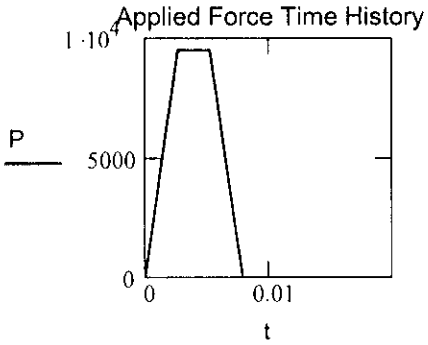
San Francisco, California 94103

LUWA Reduction Factor $rf := 0.75$ (Window height= 6'-6")

(Room height= 12'-1")

| | |
|---|---|
| Reduced Pressure | $Pre = 4.84\,psi$ |
| Total Duration | $td = 7.9\,msec$ |
| Rise Time | $tr = 2.63\,msec$ |
| Decay Time | $tp = 5.27\,msec$ |
| Total Force | $F1 = 9479.57\,lb$ |
| Response Ratios | $\frac{td}{T} = 0.09$ $\frac{Ru}{F1} = 1.98$ |
| Effective Mass | $Me = 41.24\,\frac{lb\,sec^2}{ft}$ |




| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.19\,in$ | |
| Maximum Displacement | $Xm = 0.08\,in$ | |
| Ductility | $\mu = 0.08$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.05\,deg$ | < 2 deg => ok |

HE

Date 1/22/2003

San Francisco, California 94103

SHEAR CHECK

Shear from Ru $Vu = 9385.05\,lb$

Shear from blast $Vb = 4739.78\,lb$

Concrete Shear Capacity $Vc = 8999.69\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 0.96$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (1/4"dia) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 6306.3\,lb$

Total Shear Capacity $Vn = 1.53 \times 10^4\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1.63$ > 1 => OK

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 355 Exterior Corridor
Roofr Beam E downward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 10.83 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ (no slab) |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |

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San Francisco, California 94103

Date 1/22/2003

| | | |
|---|---|---|
| Modular Ratio | $n = 10.18$ | |
| Neutral Axis of Transformed Section | $kd = 2.71\,in$ | |
| Cracked Mom. of Inertia | $Ic = 323.14\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 578.24\,in^4$ | |
| Beam Weight | $Wb = 1128.12\,lb$ | |
| Live Load Weight | $WLl = 0\,lb$ | |
| Total Weight | $Wt = 1128.12\,lb$ | |
| Total Mass | $M = 35.06\,\frac{lb\,sec^2}{ft}$ | |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 19909.84\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 14932.38\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 691933.11\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 19094.25\,lb$ | (simple & fixed ends) |
| Elastic Limit Displacement | $Xe = 0.33\,in$ | (Downward pressure) |
| Dead Load Displacement | $Xdl = 0.02\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 159.06\,Hz$ | |
| Circular Frequency | $T = 0.04\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 2.203 \cdot psi$ |
| Incident Impulse | $Is := 13.37 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1186 \cdot \frac{ft}{sec}$ |

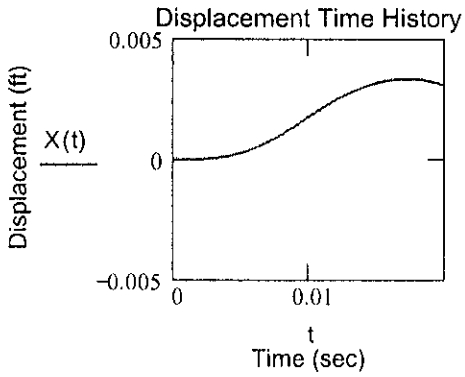
HE

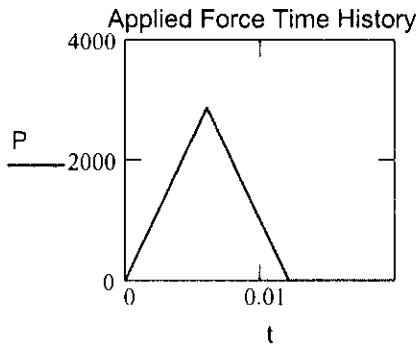
Date 1/22/2003

San Francisco, California 94103

LUWA Reduction Factor = 1 $rf := 1$ (Exterior corridor, no reduction from LUWA.)

| | |
|---|---|
| Reduced Pressure | $Pre = 2.2\,psi$ |
| Total Duration | $td = 12.14\,msec$ |
| Rise Time | $tr = 6.07\,msec$ |
| Decay Time | $tp = 12.14\,msec$ |
| Total Force | $F1 = 2863.02\,lb$ |
| Response Ratios | $\frac{td}{T} = 0.31$ $\frac{Ru}{F1} = 6.67$ |
| Effective Mass | $Me = 27.35\,\frac{lb\,sec^2}{ft}$ |




| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.04\,in$ | |
| Maximum Displacement | $Xm = 0.06\,in$ | |
| Ductility | $\mu = 0.17$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.05\,deg$ | < 2 deg => ok |

HE

Date 1/22/2003

San Francisco, California 94103

SHEAR CHECK

Shear from Ru $Vu = 9547.12\,lb$

Shear from blast $Vb = 1431.51\,lb$

Concrete Shear Capacity $Vc = 8999.69\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 0.94$ < 1 => stirrups required

SHEAR STEEL DESIGN

Shear Reinf. Area (#4) $Av := 0.049 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 6306.3\,lb$

Total Shear Capacity $Vn = 1.53 \times 10^4\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1.6$ > 1 => OK

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 355 Exterior Corridor
Roofr Beam E upward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 10.83 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ (no slab) |
| Tributary Width | $B := 20 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars. $npb := 4$

Number of NegativeTension Bars. $nnb := 3$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.79 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.59 in^2$ |
| Distance to bar centroid | $yt = 1.25 in$ |
| Effective Depths | $d = 8.25 in$ |
| | $de = 6.5 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.02$ |

| | |
|---|---|
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 2.35\,in$ |
| Cracked Mom. of Inertia | $Ic = 260.63\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 546.98\,in^4$ |
| Beam Weight | $Wb = 1128.12\,lb$ |
| Live Load Weight | $WLl = 0\,lb$ |
| Total Weight | $Wt = 1128.12\,lb$ |
| Total Mass | $M = 35.06\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Midspan Moment | $Mu_{mid} = 14932.38\,lb\,ft$ | |
| Ultimate End Moment | $Mu_{end} = 19909.84\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 654530.43\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 19512.1\,lb$ | (simple & fixed ends) |
| Elastic Limit Displacement | $Xe = 0.36\,in$ | (upward pressure) |
| Dead Load Displacement | $Xdl = 0.02\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 154.7\,Hz$ | |
| Circular Frequency | $T = 0.04\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 2.203 \cdot psi$ |
| Incident Impulse | $Is := 13.37 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1186 \cdot \frac{ft}{sec}$ |

HE

San Francisco, California 94103

Date 1/22/2003

LUWA Reduction Factor = 1 $rf := 1$

(Exterior corridor, no reduction from LUWA.)

Reduced Pressure $Pre = 2.2\,psi$

Total Duration $td = 12.14\,msec$

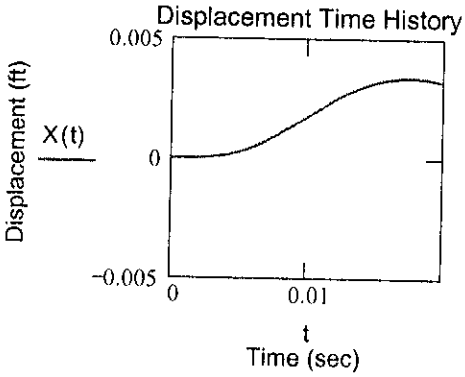
Rise Time $tr = 6.07\,msec$

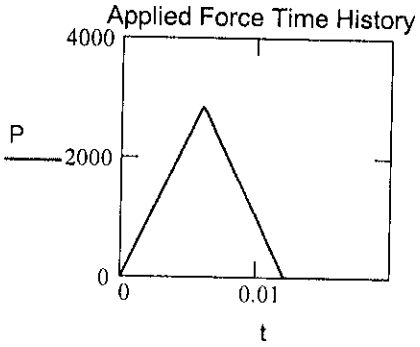
Decay Time $tp = 12.14\,msec$

Total Force $F1 = 2863.02\,lb$

Response Ratios $\frac{td}{T} = 0.3$ $\frac{Ru}{F1} = 6.82$

Effective Mass $Me = 27.35\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.04\,in$

Maximum Displacement $Xm = 0.02\,in$

Ductility $\mu = 0.06$ < 15 => ok

Max Support Rotation $\theta = 0.02\,deg$ < 2 deg => ok

SHEAR CHECK

| | | |
|---|---|---|
| Shear from Ru | $Vu = 9756.05\,lb$ | |
| Shear from blast | $Vb = 1431.51\,lb$ | |
| Concrete Shear Capacity | $Vc = 8999.69\,lb$ | |
| Shear Ratio | $\lambda v = 0.92$ | < 1 => stirrups required |

SHEAR STEEL DESIGN

| | |
|---|---|
| Shear Reinf. Area (#4) | $Av := 0.049 \cdot in^2$ |
| Shear Reinf. Spacing | $sv := 6 \cdot in$ |
| Number of Legs | $nv := 2$ |
| Steel Shear Capacity | $Vs = 6306.3\,lb$ |
| Total Shear Capacity | $Vn = 1.53 \times 10^4\,lb$ |

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1.57$ > 1 => OK

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 355-Roof Exterior Corridor
Beam F downward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 68 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 0.875 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness (no slab) | $t := 0 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Slab 1 Length (no slab) | $B1 := 0 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of PositiveTension Bars $np := 4$

Positive Tension Bar Dia $dbp := 0.75 \cdot in$

Number of NegativeTension Bars $nn := 2$

Negative Tension Bar Dia $dbn := 0.5 \cdot in$

Tributary Slab Width (no slab) $B := \frac{B1}{2}$ $B = 0 ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 1.77 in^2$ |
| Area of Negative Steel | $As_{neg} = 0.39 in^2$ |
| Distance to bar centroid | $yt = 1.5 in$ |
| Effective Depths | $d = 66.5 in$ |
| | $de = 65 in$ |
| Gross Mom. of Inertia | $Ig = 157216 in^4$ |
| Steel Percentage | $\rho = 0.0044$ |

| | |
|---|---|
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 16.73\,in$ |
| Cracked Mom. of Inertia | $Ic = 54742.07\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 105979.04\,in^4$ |
| Beam Weight | $Wb = 6800\,lb$ |
| Slab Weight | $Ws = 0\,lb$ |
| Live Load Weight | $WLl = 0\,lb$ |
| Total Weight | $Wt = 6800\,lb$ |
| Total Mass | $M = 211.35\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | |
|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 447971.48\,lb\,ft$ |
| Ultimate Negative Moment | $Mu_{neg} = 99549.22\,lb\,ft$ |
| Elastic Stiffness | $Ke = 3.93 \times 10^7\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 266960.35\,lb$ (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 0.08\,in$ |
| Dead Load Displacement | $Xdl = 0.0021\,in$ |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 488.43\,Hz$ | |
| Circular Frequency | $T = 0.01\,sec$ | |

LOAD TIME HISTORY

Incident Pressure $Ps := 2.202 \cdot psi$

Incident Impulse $Is := 13.36 \cdot psi \cdot msec$

Shock Front Velocity $U := 1186 \cdot \frac{ft}{sec}$

LUWA Reduction Factor = 1 $rf := 1.0$ (Exterior Beam: no reduction)

Reduced Pressure $Pre = 2.2\,psi$

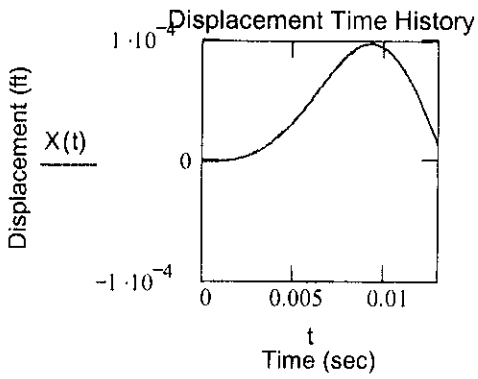
Total Duration $td = 12.13\,msec$

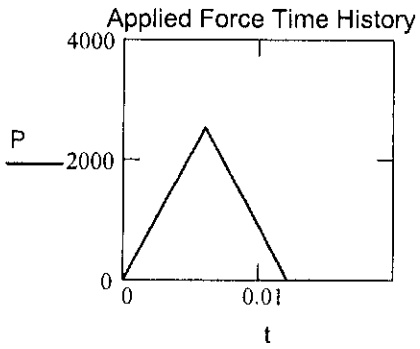
Rise Time $tr = 6.07\,msec$

Total Force $F1 = 2536.7\,lb$

Response Ratios $\frac{td}{T} = 0.94$ $\frac{Ru}{F1} = 105.24$

Effective Mass $Me = 164.85 \frac{lb\,sec^2}{ft}$



HE

Date 1/24/2003

San Francisco, California 94103

| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.0012\,in$ | |
| Maximum Displacement | $Xm = 0.0032\,in$ | |
| Ductility | $\mu = 0.04$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.0019\,deg$ | < 2 deg => ok |

CHECK SHEAR FROM Ru

| | | | |
|---|---|---|---|
| Shear from Ru | | $Vu = 133480.17\,lb$ | |
| Shear from blast | | $Vb = 1268.35\,lb$ | |
| Concrete Shear Capacity | | $Vc = 43525.76\,lb$ | |
| Shear Ratio | $\lambda v := \frac{Vc}{Vu}$ | $\lambda v = 0.33$ | < 1 => stirrups required |

SHEAR STEEL CHECK

| | | |
|---|---|---|
| Shear Reinf. Area (0.244"dia) | $Av := 0.047 \cdot in^2$ | (Clinton Wire Mesh) |
| Shear Reinf. Spacing | $sv := 2 \cdot in$ | |
| Number of Legs | $nv := 2$ | |
| Steel Shear Capacity | $Vs = 146273.4\,lb$ | |
| Total Shear Capacity | $Vn = 1.9 \times 10^5\,lb$ | |
| | $\lambda := \frac{Vn}{Vu}$ $\lambda = 1.42$ | <1 =>OK |

CHECK SHEAR FROM BLAST PRESSURE (blast pressure acting on the larger face of the beam. h=27")

Load from blast $F_b := Pre \cdot L \cdot h$ $F_b = 28749.31\,lb$

Beam is supported along its entire length by ledger angles and metal deck. Check to make sure beam does not shear off.

Beam shear capacity $Vc = 43525.76\,lb$ $Vc > Fb$ OK

HE

Date 1/22/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 355-Roof Exterior Corridor
Beam F upward

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 16 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 68 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 0.875 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness (no slab) | $t := 0 \cdot in$ | Live Load | $LL := 0 \cdot lb \cdot ft^{-2}$ |
| Slab 1 Length (no slab) | $B1 := 0 \cdot ft$ | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

Number of Tension Bars at midspan $np := 2$

Midspan Tension Bar Dia $dbp := 0.5 \cdot in$

Number of Tension Bars at endspan $nn := 4$

Endspan Tension Bar Dia $dbn := 0.75 \cdot in$

Tributary Slab Width (no slab) $B := \frac{B1}{2}$ $B = 0 ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 0.39 in^2$ |
| Area of Negative Steel | $As_{neg} = 1.77 in^2$ |
| Distance to bar centroid | $yt = 1.38 in$ |
| Effective Depths | $d = 66.63 in$ |
| | $de = 65.25 in$ |
| Gross Mom. of Inertia | $Ig = 157216 in^4$ |

| | |
|---|---|
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 7\,in$ |
| Cracked Mom. of Inertia | $Ic = 15404.97\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 86310.48\,in^4$ |
| Beam Weight | $Wb = 6800\,lb$ |
| Slab Weight | $Ws = 0\,lb$ |
| Live Load Weight | $WLl = 0\,lb$ |
| Total Weight | $Wt = 6800\,lb$ |
| Total Mass | $M = 211.35\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 99932.1\,lb\,ft$ | |
| Ultimate Negative Moment | $Mu_{neg} = 449694.44\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 3.2 \times 10^7\,\frac{lb}{ft}$ | |
| Ultimate Resistance | $Ru = 281613.27\,lb$ | (Fixed Ends) (Upward pressure) |
| Elastic Limit Displacement | $Xe = 0.11\,in$ | |
| Dead Load Displacement | $Xdl = 0.0025\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 440.78\,Hz$ | |
| Circular Frequency | $T = 0.01\,sec$ | |

LOAD TIME HISTORY

Incident Pressure $Ps := 2.202 \cdot psi$

Incident Impulse $Is := 13.36 \cdot psi \cdot msec$

Shock Front Velocity $U := 1186 \cdot \frac{ft}{sec}$

LUWA Reduction Factor = 1 $rf := 1.0$ (Exterior Beam: no reduction)

Reduced Pressure $Pre = 2.2\,psi$

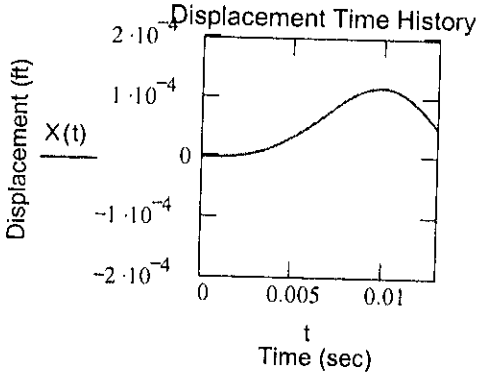
Total Duration $td = 12.13\,msec$

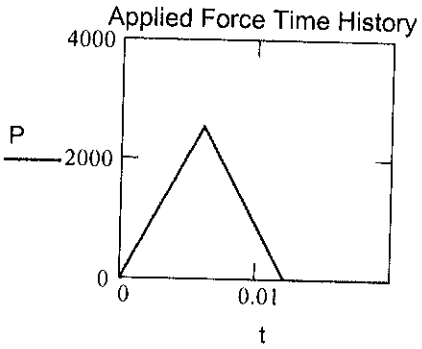
Rise Time $tr = 6.07\,msec$

Total Force $F1 = 2536.7\,lb$

Response Ratios $\frac{td}{T} = 0.85$ $\frac{Ru}{F1} = 111.02$

Effective Mass $Me = 164.85 \frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 0.0014\,in$

Maximum Displacement $Xm = 0.0011\,in$

Ductility $\mu = 0.01$ < 15 => ok

Max Support Rotation $\theta = 0.0007\,deg$ < 2 deg => ok

HE

Date 1/24/2003

San Francisco, California 94103

CHECK SHEAR FROM Ru

Shear from Ru $Vu = 140806.64\,lb$

Shear from blast $Vb = 1268.35\,lb$

Concrete Shear Capacity $Vc = 43607.58\,lb$

Shear Ratio $\lambda v := \frac{Vc}{Vu}$ $\lambda v = 0.31$ < 1 => stirrups required

SHEAR STEEL CHECK

Shear Reinf. Area (0.244"dia) $Av := 0.047 \cdot in^2$ (Clinton Wire Mesh)

Shear Reinf. Spacing $sv := 2 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 146548.35\,lb$

Total Shear Capacity $Vn = 1.9 \times 10^5\,lb$

$\lambda := \frac{Vn}{Vu}$ $\lambda = 1.35$ <1 =>OK

CHECK SHEAR FROM BLAST PRESSURE (blast pressure acting on the larger face of the beam. h=27")

Load from blast $F_b = 28749.31\,lb$

Beam is supported along its entire length by ledger angles and metal deck. Check to make sure beam does not shear off.

Beam shear capacity $Vc = 43607.58\,lb$ $Vc > Fb$ OK

HE

Date 1/22/2003

San Francisco, California 94103

Schofiled Barracks 3A
Building 355
Breezeway Column - 1st Floor wall tied to column **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Column Depth | $h := 14 \cdot in$ | Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Column Width | $b := 14 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Unbraced Length | $L := 11 \cdot ft$ (to bottom of beam H.) | Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| | | Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| No. of Bars ea. side | $n := 2$ | Reinforcing Bars Diameter | $db := 1 \cdot in$ |
| Shear Ties | $ds := 0.25 \cdot in$ | Slab Length | $s1 := 20 \cdot ft$ |
| Tie Spacing | $st := 11 \cdot in$ | Slab Width | $s2 := 16.58 \cdot ft$ |
| Concrete Cover | $c := 1.5 \cdot in$ | Slab Thickness | $t := 6 \cdot in$ |
| Number of Floors (above column level) | $nf := 2$ | Slab Live Load | $LLc := 50 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H depth | $d_H := 14 \cdot in$ | Roof Live Load | $LLr := 20 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H width | $b_H := 14 \cdot in$ | Roof Dead Load | $DLr := 15 \cdot lb \cdot ft^{-2}$ |
| Roof Beam A,C,D depth | $d_A := 10 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Roof Beam A,C,D width | $b_A := 10 \cdot in$ | | $Ec = 2.85 \times 10^6 psi$ |
| Concrete Dyn. Increase Factor | $DIFc := 1.17$ | | |
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | | |
| Dynamic Conc. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 psi$ | |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 psi$ | |

MATERIAL PROPERTIES

| | |
|---|---|
| Area of Steel | $As = 1.57 in^2$ |
| Tension Steel Centroid | $yt = 2 in$ |
| Effective Depths | $d = 12 in$ |
| | $de = 10 in$ |
| Gross Mom. of Inertia | $Ig = 3201.33 in^4$ |
| Steel Percentage | $\rho = 0.009$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 3.85 in$ |

| | |
|---|---|
| Cracked Mom. of Inertia | $Ic = 1377.31\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 2289.32\,in^4$ |
| Tributary Area | $Af = 331.6\,ft^2$ |
| Floor Slab Weight | $Wf = 24870\,lb$ |
| Beam Weigth | $Wb = 11977.08\,lb$ |
| Roof Weight | $Wr = 4974\,lb$ |
| Live Load Force | $Pl = 9948\,lb$ |
| Total Axial Load on Column | $Pt = 76639.08\,lb$ |
| Concrete Compressive Capacity | $Pc = 487305\,lb$ |
| | $> \; Pt = 76639.08\,lb$ OK |
| Buckling Capacity Load | $Pb = 3.7 \times 10^6\,lb$ |
| | $> \; Pt = 7.66 \times 10^4\,lb$ OK |
| Weight | $Wt = 2245.83\,lb$ |
| Mass | $M = 69.8\,\frac{lb\,sec^2}{ft}$ |
| Ultimate Moments | $Mu = 62308.25\,lb\,ft$ |
| Elastic Stiffness | $Ke = 2.61 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 45315.09\,lb$ |
| Elastic Limit Displacement | $Xe = 0.21\,in$ (simple – simple) |

PERIOD OF VIBRATION

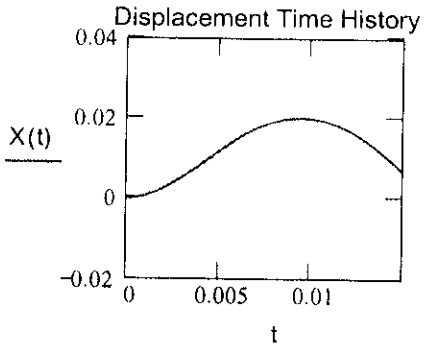
| | |
|---|---|
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 228.08\,Hz$ |
| Period of Vibration | $T = 0.03\,sec$ |

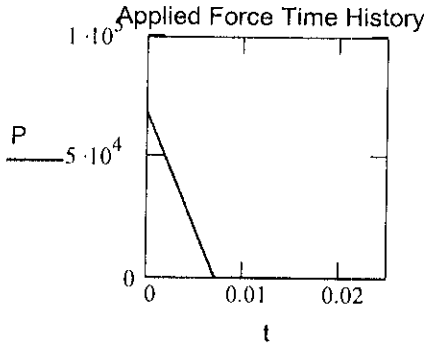
FLEXURAL RESPONSE

| | |
|---|---|
| Peak Incident Pressure | $Peq := 7.859 \cdot psi$ |
| Incident Impulse | $Ieq := 28.07 \cdot psi \cdot msec$ |
| Column Blast Duration | $td = 7.1434\,msec$ |
| Total Force | $F1 = 68467.61\,lb$ |

RESPONSE

Equivalent Mass $Me = 50.26 \frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xm = 0.24\,in$

Peak Support Rotation $\theta = 0.21\,deg$ <2 OK

Ductility $\mu = 1.17$ <3 OK

P Delta Moment $M_{p\Delta} = 1547.7\,lb\,ft$

$Mu = 62308.25\,lb\,ft$ $Mp\Delta < Mu$ =>OK

Ultimate Shear Reaction $Vu = 2.27 \times 10^4\,lb$

Concrete Shear Capacity $Vc = 1.82 \times 10^4\,lb$

Shear Tie Shear Capacity

Shear Reinf. Area (1/4"dia) $Av = 0.049\,in^2$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 5097.95\,lb$

Total Shear Capacity $Vn = 2.33 \times 10^4\,lb$ $Vn > Vu$ =>OK

HE

San Francisco, California 94103

Date 1/22/2003

Schofiled Barracks 3A
Building 355
Exterior Corridor Column - 1st Floor **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | |
|---|---|
| Column Depth | $h := 10 \cdot in$ |
| Column Width | $b := 48 \cdot in$ |
| Unbraced Length | $L := 12.58 \cdot ft$ |
| No. of Bars ea. side | $n := 3$ |
| Shear Ties | $ds := 0.375 \cdot in$ |
| Tie Spacing | $st := 24 \cdot in$ |
| Concrete Cover | $c := 0.94 \cdot in$ |
| Number of Floors (above column level) | $nf := 2$ |
| Concrete Dyn. Increase Factor | $DIFc := 1.17$ |
| Steel Dyn. Increase Factor | $DIFs := 1.19$ |
| Dynamic Conc. Strength | $fdc := DIFc \cdot fc$ |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ |

| | |
|---|---|
| Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Reinforcing Bars Diameter | $db := 0.375 \cdot in$ |
| Slab Length | $s1 := 20 \cdot ft$ |
| Slab Width | $s2 := 10.83 \cdot ft$ |
| Slab Ave. thickness | $t := 4 \cdot in$ |
| Corridor Live Load | $LLc := 100 \cdot lb \cdot ft^{-2}$ |
| Roof Live Load | $LLr := 20 \cdot lb \cdot ft^{-2}$ |
| Roof Dead Load | $DLr := 12 \cdot lb \cdot ft^{-2}$ |

$fdc = 2925\,psi$

$fdy = 47600\,psi$

MATERIAL PROPERTIES

| | |
|---|---|
| Area of Steel | $As = 0.33\,in^2$ |
| Tension Steel Centroid | $yt = 1.5\,in$ |
| Effective Depths | $d = 8.5\,in$ |
| | $de = 7\,in$ |
| Gross Mom. of Inertia | $Ig = 4000\,in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 1.06\,in$ |

| | |
|---|---|
| Cracked Mom. of Inertia | $Ic = 206.15\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 2103.07\,in^4$ |
| Tributary Area | $Af = 108.3\,ft^2$ |
| Floor Weight | $Wf = 5415\,lb$ |
| Roof Weight | $Wr = 1299.6\,lb$ |
| Live Load Force | $Pl = 5956.5\,lb$ |
| Total Axial Load on Column | $Pt = 18086.1\,lb$ |
| Concrete Compressive Capacity | $Pc = 1.19 \times 10^6\,lb$ |
| | $> \; Pt = 1.81 \times 10^4\,lb$ OK |
| Buckling Capacity Load | $Pb = 2.6 \times 10^6\,lb$ |
| | $> \; Pt = 1.81 \times 10^4\,lb$ OK |
| Weight | $Wt = 6290\,lb$ |
| Mass | $M = 195.5\,\frac{lb\,sec^2}{ft}$ |
| Ultimate Moments | $Mu = 9193.63\,lb\,ft$ |
| Elastic Stiffness | $Ke = 1.61 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 5846.51\,lb$ |
| Elastic Limit Displacement | $Xe = 0.04\,in$ |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 106.8\,Hz$ |
| Period of Vibration | $T = 0.06\,sec$ |

FLEXURAL RESPONSE

| | | |
|---|---|---|
| Peak Incident Pressure | $Peq := 2.463 \cdot psi$ | Eq uniform load over effective area |
| Incident Impulse | $Ieq := 14.44 \cdot psi \cdot msec$ | |
| Column Blast Duration | $td = 11.7255\,msec$ | |
| Total Force | $F1 = 17847.1\,lb$ | |

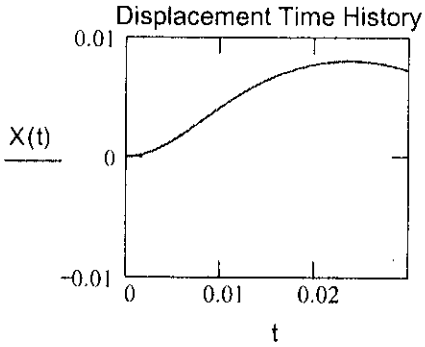
HE

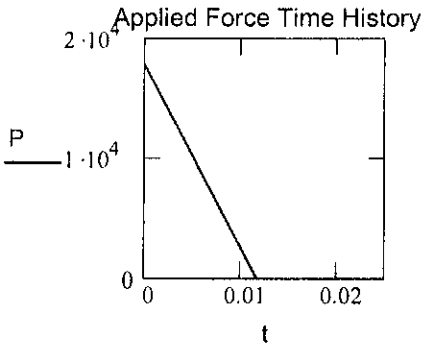
Date 1/22/2003

San Francisco, California 94103

RESPONSE

Equivalent Mass $Me = 140.76 \frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xm = 0.1\,in$

Peak Support Rotation $\theta = 0.07\,deg$ <2 OK

Ductility $\mu = 2.21$ <3 OK

P Delta Moment $M_{p\Delta} = 145.33\,lb\,ft$

$Mu = 9193.63\,lb\,ft$ $Mp\Delta < Mu$ => OK

Ultimate Shear Reaction $Vu = 2.92 \times 10^3\,lb$

Concrete Shear Capacity $Vc = 4.41 \times 10^4\,lb$ Vc > Vu =>OK

HE

Date 1/22/2003

San Francisco, California 94103

Schofiled Barracks 3A
Building 356
Interior Closer Column - 1st Floor **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Column Depth | $h := 14 \cdot in$ | Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Column Width | $b := 14 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Unbraced Length | $L := 12.1 \cdot ft$ (to bottom of slab) | Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| | | Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| No. of Bars ea. side | $n := 2$ | Reinforcing Bars Diameter | $db := 1 \cdot in$ |
| Shear Ties | $ds := 0.25 \cdot in$ | Slab Length | $s1 := 20 \cdot ft$ |
| Tie Spacing | $st := 12 \cdot in$ | Slab Width | $s2 := 16.58 \cdot ft$ |
| Concrete Cover | $c := 1.5 \cdot in$ | Slab Thickness | $t_s := 6 \cdot in$ |
| Number of Floors (above column level) | $nf := 2$ | Slab Live Load | $LLc := 50 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H depth | $d_H := 14 \cdot in$ | Roof Live Load | $LLr := 20 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H width | $b_H := 14 \cdot in$ | Roof Dead Load | $DLr := 15 \cdot lb \cdot ft^{-2}$ |
| Roof Beam A,C,D depth | $d_A := 10 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Roof Beam A,C,D width | $b_A := 10 \cdot in$ | | $Ec = 2.85 \times 10^6 psi$ |
| Concrete Dyn. Increase Factor | $DIFc := 1.17$ | | |
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | | |
| Dynamic Conc. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 psi$ | |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 psi$ | |

MATERIAL PROPERTIES

| | |
|---|---|
| Area of Steel | $As = 1.57 in^2$ |
| Tension Steel Centroid | $yt = 2 in$ |
| Effective Depths | $d = 12 in$ |
| | $de = 10 in$ |
| Gross Mom. of Inertia | $Ig = 3201.33 in^4$ |
| Steel Percentage | $\rho = 0.009$ |
| Modular Ratio | $n = 10.18$ |

| | |
|---|---|
| Neutral Axis of Transformed Section | $kd = 3.85\,in$ |
| Cracked Mom. of Inertia | $Ic = 1377.31\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 2289.32\,in^4$ |
| Tributary Area | $Af = 331.6\,ft^2$ |
| Floor Slab Weight | $Wf = 24870\,lb$ |
| Beam Weigth | $Wb = 11977.08\,lb$ |
| Roof Weight | $Wr = 4974\,lb$ |
| Live Load Force | $Pl = 9948\,lb$ |
| Total Axial Load on Column | $Pt = 76639.08\,lb$ |
| Concrete Compressive Capacity | $Pc = 487305\,lb$ |
| | $> \; Pt = 7.66 \times 10^4\,lb$ OK |
| Buckling Capacity Load | $Pb = 3.05 \times 10^6\,lb$ |
| | $> \; Pt = 7.66 \times 10^4\,lb$ OK |
| Weight | $Wt = 2470.42\,lb$ |
| Mass | $M = 76.78\,\frac{lb\,sec^2}{ft}$ |
| Ultimate Moments | $Mu = 62308.25\,lb\,ft$ |
| Elastic Stiffness | $Ke = 1.96 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 41195.54\,lb$ |
| Elastic Limit Displacement | $Xe = 0.25\,in$ |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.78$ |
| Circular Frequency | $\omega = 181.1\,Hz$ |
| Period of Vibration | $T = 0.03\,sec$ |

FLEXURAL RESPONSE

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 42.18 \cdot psi$ |
| Reflective Impulse | $I := 89.80 \cdot psi \cdot msec$ |

HE

San Francisco, California 94103

Date 1/22/2003

## LUWA Reduction Factor due to Window opening

LUWA Reduction Factor $rf := 0.61$ (Window height= 4'-6") (Room height= 12'-1")

Reduced Pressure $Pre = 25.73\,psi$

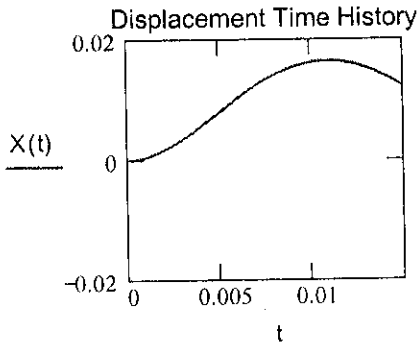
Total Duration $td = 6.98\,msec$

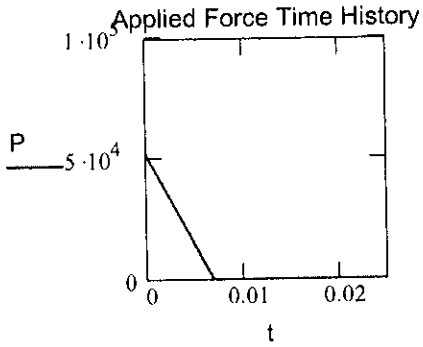
Total Force $F1 = 52303.54\,lb$

Response Ratios $\frac{td}{T} = 0.2$ $\frac{Ru}{F1} = 0.79$

RESPONSE

Equivalent Mass $Me = 59.89\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xm = 0.2\,in$

Peak Support Rotation $\theta = 0.15\,deg$ <2 OK

Ductility $\mu = 0.77$ <3 OK

| | | |
|---|---|---|
| P Delta Moment | $M_{p\Delta} = 1245.43\,lb\,ft$ | |
| | $Mu = 62308.25\,lb\,ft$ | $Mp\Delta < Mu$ => OK |
| Ultimate Shear Reaction | $Vu = 2.06 \times 10^4\,lb$ | |
| Concrete Shear Capacity | $Vc = 1.82 \times 10^4\,lb$ | |
| Shear Tie Shear Capacity | | |
| Shear Reinf. Area (1/4"dia) | $Av = 0.049\,in^2$ | |
| Number of Legs | $nv := 2$ | |
| Steel Shear Capacity | $Vs = 4673.12\,lb$ | |
| Total Shear Capacity | $Vn = 2.28 \times 10^4\,lb$ | $Vn > Vu$ =>OK |

HE

Date 1/22/2003

San Francisco, California 94103

Schofiled Barracks 3A
Building 356
Interior Closer Column - 2nd Floor **OK**

VC

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Column Depth | $h := 12 \cdot in$ | Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Column Width | $b := 12 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Unbraced Length | $L := 12.1 \cdot ft$ (to bottom of slab) | Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| | | Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| No. of Bars ea. side | $n := 2$ | Reinforcing Bars Diameter | $db := 0.75 \cdot in$ |
| Shear Ties | $ds := 0.25 \cdot in$ | Slab Length | $s1 := 20 \cdot ft$ |
| Tie Spacing | $st := 12 \cdot in$ | Slab Width | $s2 := 16.58 \cdot ft$ |
| Concrete Cover | $c := 1.62 \cdot in$ | Slab Thickness | $t := 6 \cdot in$ |
| Number of Floors (above column level) | $nf := 1$ | Slab Live Load | $LLc := 50 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H depth | $d_H := 14 \cdot in$ | Roof Live Load | $LLr := 20 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H width | $b_H := 14 \cdot in$ | Roof Dead Load | $DLr := 15 \cdot lb \cdot ft^{-2}$ |
| Roof Beam A,C,D depth | $d_A := 10 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Roof Beam A,C,D width | $b_A := 10 \cdot in$ | | $Ec = 2.85 \times 10^6 psi$ |
| Concrete Dyn. Increase Factor | $DIFc := 1.17$ | | |
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | | |
| Dynamic Conc. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 psi$ | |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 psi$ | |

MATERIAL PROPERTIES

| | |
|---|---|
| Area of Steel | $As = 0.88 in^2$ |
| Tension Steel Centroid | $yt = 2 in$ |
| Effective Depths | $d = 10 in$ |
| | $de = 8.01 in$ |
| Gross Mom. of Inertia | $Ig = 1728 in^4$ |
| Steel Percentage | $\rho = 0.007$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 3.02 in$ |

Cracked Mom. of Inertia $Ic = 557.36\,in^4$

Avg. Mom. of Inertia $Ia = 1142.68\,in^4$

Tributary Area $Af = 331.6\,ft^2$

Floor Slab Weight $Wf = 24870\,lb$

Beam Weigth $Wb = 7893.75\,lb$

Roof Weight $Wr = 4974\,lb$

Live Load Force $Pl = 5803\,lb$

Total Axial Load on Column $Pt = 43540.75\,lb$

Concrete Compressive Capacity $Pc = 358020\,lb$

$> \quad Pt = 4.35 \times 10^4\,lb$ OK

Buckling Capacity Load $Pb = 1.52 \times 10^6\,lb$

$> \quad Pt = 4.35 \times 10^4\,lb$ OK

Weight $Wt = 1815\,lb$

Mass $M = 56.41\,\frac{lb\,sec^2}{ft}$

Ultimate Moments $Mu = 28073.76\,lb\,ft$

Elastic Stiffness $Ke = 980418\,\frac{lb}{ft}$

Ultimate Resistance $Ru = 18561.17\,lb$

Elastic Limit Displacement $Xe = 0.23\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := 0.78$

Circular Frequency $\omega = 149.27\,Hz$

Period of Vibration $T = 0.04\,sec$

FLEXURAL RESPONSE

Peak Reflective Pressure $Pr := 34.43 \cdot psi$

Reflective Impulse $I := 81.93 \cdot psi \cdot msec$

San Francisco, California 94103

Date 1/22/2003

## LUWA Reduction Factor due to Window opening

LUWA Reduction Factor $rf := 0.75$ (Window height= 6'-6")

(Room height= 12'-1")

Reduced Pressure $Pre = 25.82\,psi$

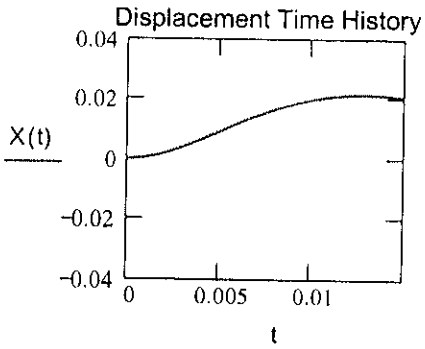
Total Duration $td = 6.35\,msec$

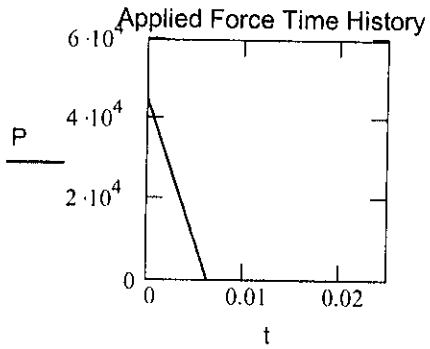
Total Force $F1 = 44993.12\,lb$

Response Ratios $\frac{td}{T} = 0.15$ $\frac{Ru}{F1} = 0.41$

RESPONSE

Equivalent Mass $Me = 44\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xm = 0.26\,in$

Peak Support Rotation $\theta = 0.2\,deg$ <2 OK

Ductility $\mu = 1.14$ <3 OK

| | | |
|---|---|---|
| P Delta Moment | $M_{p\Delta} = 939.04\,lb\,ft$ | |
| | $Mu = 28073.76\,lb\,ft$ | $Mp\Delta < Mu$ => OK |
| Ultimate Shear Reaction | $Vu = 9.28 \times 10^3\,lb$ | |
| Concrete Shear Capacity | $Vc = 1.3 \times 10^4\,lb$ | |
| Shear Tie Shear Capacity | | |
| Shear Reinf. Area (1/4"dia) | $Av = 0.049\,in^2$ | |
| Number of Legs | $nv := 2$ | |
| Steel Shear Capacity | $Vs = 3896.21\,lb$ | |
| Total Shear Capacity | $Vn = 1.69 \times 10^4\,lb$ | Vn > Vu =>OK |

HE

Date 1/22/2003

San Francisco, California 94103

Schofiled Barracks 3A
Building 356
Interior Closer Column - 3rd Floor OK

VC

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Column Depth | $h := 10 \cdot in$ | Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Column Width | $b := 10 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Unbraced Length | $L := 12.1 \cdot ft$ (to bottom of slab) | Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| | | Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| No. of Bars ea. side | $n := 2$ | Reinforcing Bars Diameter | $db := 0.5 \cdot in$ |
| Shear Ties | $ds := 0.25 \cdot in$ | Slab Length | $s1 := 20 \cdot ft$ |
| Tie Spacing | $st := 12 \cdot in$ | Slab Width | $s2 := 16.58 \cdot ft$ |
| Concrete Cover | $c := 1.75 \cdot in$ | Slab Thickness | $t := 6 \cdot in$ |
| Number of Floors (above column level) | $nf := 0$ | Slab Live Load | $LLc := 50 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H depth | $d_H := 14 \cdot in$ | Roof Live Load | $LLr := 20 \cdot lb \cdot ft^{-2}$ |
| Floor Beam H width | $b_H := 14 \cdot in$ | Roof Dead Load | $DLr := 15 \cdot lb \cdot ft^{-2}$ |
| Roof Beam A,C,D depth | $d_A := 10 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Roof Beam A,C,D width | $b_A := 10 \cdot in$ | | $Ec = 2.85 \times 10^6 psi$ |
| Concrete Dyn. Increase Factor | $DIFc := 1.17$ | | |
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | | |
| Dynamic Conc. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 psi$ | |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 psi$ | |

MATERIAL PROPERTIES

| | |
|---|---|
| Area of Steel | $As = 0.39 in^2$ |
| Tension Steel Centroid | $yt = 2 in$ |
| Effective Depths | $d = 8 in$ |
| | $de = 6 in$ |
| Gross Mom. of Inertia | $Ig = 833.33 in^4$ |
| Steel Percentage | $\rho = 0.005$ |
| Modular Ratio | $n = 10.18$ |

HE

San Francisco, California 94103

Date 1/22/2003

| | |
|---|---|
| Neutral Axis of Transformed Section | $kd = 2.14\,in$ |
| Cracked Mom. of Inertia | $Ic = 169.96\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 501.64\,in^4$ |
| Tributary Area | $Af = 331.6\,ft^2$ |
| Floor Slab Weight | $Wf = 24870\,lb$ |
| Beam Weigth | $Wb = 3810.42\,lb$ |
| Roof Weight | $Wr = 4974\,lb$ |
| Live Load Force | $Pl = 1658\,lb$ |
| Total Axial Load on Column | $Pt = 10442.42\,lb$ |
| Concrete Compressive Capacity | $Pc = 248625\,lb$ |
| | $> \; Pt = 1.04 \times 10^4\,lb$ OK |
| Buckling Capacity Load | $Pb = 669279.28\,lb$ |
| | $> \; Pt = 1.04 \times 10^4\,lb$ OK |
| Weight | $Wt = 1260.42\,lb$ |
| Mass | $M = 39.18\,\frac{lb\,sec^2}{ft}$ |
| Ultimate Moments | $Mu = 9346.24\,lb\,ft$ |
| Elastic Stiffness | $Ke = 430411.12\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 6179.33\,lb$ |
| Elastic Limit Displacement | $Xe = 0.17\,in$ |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.78$ |
| Circular Frequency | $\omega = 118.68\,Hz$ |
| Period of Vibration | $T = 0.05\,sec$ |

FLEXURAL RESPONSE

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 22.21 \cdot psi$ |
| Reflective Impulse | $I := 66.39 \cdot psi \cdot msec$ |

HE

San Francisco, California 94103

Date 1/22/2003

## LUWA Reduction Factor due to Window opening

LUWA Reduction Factor $rf := 0.75$ (Window height= 6'-6") (Room height= 12'-1")

Reduced Pressure $Pre = 16.66\,psi$

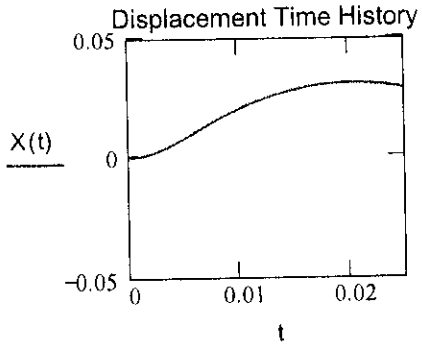
Total Duration $td = 7.97\,msec$

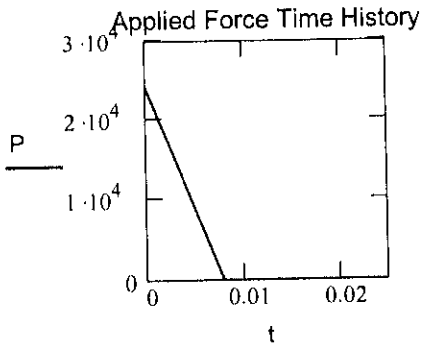
Total Force $F1 = 24186.69\,lb$

Response Ratios $\frac{td}{T} = 0.15$ $\frac{Ru}{F1} = 0.26$

RESPONSE

Equivalent Mass $Me = 30.56\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xm = 0.37\,in$

Peak Support Rotation $\theta = 0.29\,deg$ <2 OK

Ductility $\mu = 2.16$ <3 OK

HE

Date 1/22/2003

San Francisco, California 94103

| | | |
|---|---|---|
| P Delta Moment | $M_{p\Delta} = 324.23\,lb\,ft$ | |
| | $Mu = 9346.24\,lb\,ft$ | $Mp\Delta < Mu$ => OK |
| Ultimate Shear Reaction | $Vu = 3.09 \times 10^3\,lb$ | |
| Concrete Shear Capacity | $Vc = 8.65 \times 10^3\,lb$ | |
| Shear Tie Shear Capacity | | |
| Shear Reinf. Area (1/4"dia) | $Av = 0.049\,in^2$ | |
| Number of Legs | $nv := 2$ | |
| Steel Shear Capacity | $Vs = 3115.41\,lb$ | |
| Total Shear Capacity | $Vn = 1.18 \times 10^4\,lb$ | $Vn > Vu$ =>OK |

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356,357,358
Roof Metal Deck Type B 1.5" **No Good**

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

B formlock

| | |
|---|---|
| Thickness (18 ga.) | $t_{deck} := 0.0478 \cdot in$ |
| Span Length | $L := 6 \cdot ft$ |
| Moment of Inertia | $I := 0.302 \cdot in^4$ |
| Modulus of Elasticity | $Z := 0.322 \cdot in^3$ |
| Exposed width | $b := 12 \cdot in$ |
| Number of vertical sections in 12" section | $Nl := 4$ |
| Effective width | $s := 16.5 \cdot in$ |
| Dynamic Increase Factor | $c := 1.1$ |
| Avg. Strength Increase | $a := 1.21$ |

| | |
|---|---|
| Pan Yield Strength | $fy := 33400 \cdot lb \cdot in^{-2}$ |
| Modulus of Elasticity | $E := 29000000 \cdot lb \cdot in^{-2}$ |
| Steel Wt Density | $\gamma_s := 490 \cdot lb \cdot ft^{-3}$ |
| Depth of decking | $h := 1.5 \cdot in$ |
| Live load | $LL := 20 \cdot \frac{lb}{ft^2}$ |

Effective width is the flattened distance.
2 top flat sections, 2 bottom flat sections, and 4 vertical sections.

Dynamic Yield Strength of Pan $fdy := c \cdot a \cdot fy$ $fdy = 44455.4\, lb \cdot in^{-2}$

| | |
|---|---|
| Ultimate Moment | $Mu = 1192.89\, lb\, ft$ |
| Ultimate Resistance-no gravity effects | $Rut = 2385.77\, lb$ |
| Total Mass | $wd = 2.68 \frac{lb}{ft^2}$ |
| | $M = 1.43 \frac{lb\, sec^2}{ft}$ |
| Ultimate Resistance-with gravity effects | $Ru = 2101.09\, lb$ |
| Equivalent Elastic Deflection | $Xe = 0.05\, ft$ |
| Elastic Stiffness | $Ke = 45414.76 \frac{lb}{ft}$ |
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 209.81\, Hz$ |
| Period of Vibration | $T = 0.0299\, sec$ |
| Dead Load Displacement | $Xdl = 0.0122\, in$ |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.940 \cdot lb \cdot in^{-2}$ |
| Incident Impulse | $Is := 26.43 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1324 \cdot \frac{ft}{sec}$ |

HE

San Francisco, California 94103

Date 1/24/2003

Rise Time $tr = 4.53\,msec$

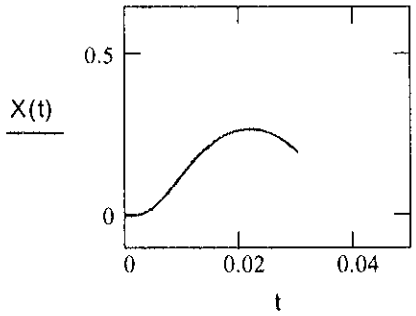
Equivalent Duration $td = 12.15\,msec$

Total Force $F1 = 5996.16\,lb$

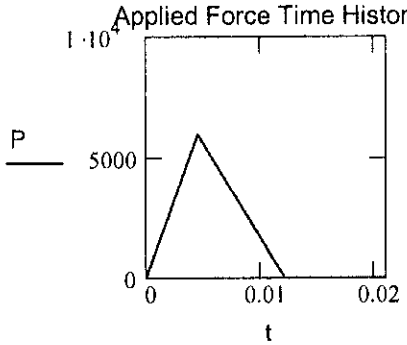
RESPONSE

Equivalent Mass $Me = 1.03\,\frac{lb\,sec^2}{ft}$

Displacement Time History




Applied Force Time History




Dynamic Displacement $Xd = 3.25\,in$

Maximum Displacement $Xm = 3.26\,in$

Peak Support Rotation $\theta = 5.17\,deg$ >4 deg => NG

Ductility $\mu = 5.74$ < 6 => OK

Applied Shear $Vu = 1050.55\,lb$

Deck Shear Area $Av = 0.57\,in^2$

Ultimate Simple Shear $V_{deck} = 14024.79\,lb$

Shear Ratio $\lambda_v = 13.35$ > 1 => OK

RESISTANCE TO JOIST

Resistance per foot $Ruft = 2101.09\,\frac{lb}{ft}$



LIMITED OFFICIAL USE

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356,357,358
Roof Metal Deck Type W2" OK

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

W2 formlock

| | |
|---|---|
| Thickness (18 ga.) | $t_{deck} := 0.0478 \cdot in$ |
| Span Length | $L := 6 \cdot ft$ |
| Moment of Inertia | $I := 0.555 \cdot in^4$ |
| Modulus of Elasticity | $Z := 0.510 \cdot in^3$ |
| Exposed width | $b := 12 \cdot in$ |
| Number of vertical sections in 12" section | $Nl := 2$ |
| Effective width | $s := 14.47 \cdot in$ |
| Dynamic Increase Factor | $c := 1.1$ |
| Avg. Strength Increase | $a := 1.21$ |

| | |
|---|---|
| Deck Yield Strength | $fy := 33400 \cdot lb \cdot in^{-2}$ |
| Modulus of Elasticity | $E := 29000000 \cdot lb \cdot in^{-2}$ |
| Steel Wt Density | $\gamma_s := 490 \cdot lb \cdot ft^{-3}$ |
| Depth of decking | $h := 2 \cdot in$ |
| Live load | $LL := 20 \cdot \frac{lb}{ft^2}$ |

Effective width is the flattened distance.
top and bottom flat sections, and 2 vertical sections.

Dynamic Yield Strength of deck $fdy := c \cdot a \cdot fy$ $fdy = 44455.4\, lb \cdot in^{-2}$

| | |
|---|---|
| Ultimate Moment | $Mu = 1889.35\, lb\, ft$ |
| Ultimate Resistance-no gravity effects | $Rut = 3778.71\, lb$ |
| Total Mass | $wd = 2.35 \frac{lb}{ft^2}$ |
| | $M = 1.37 \frac{lb\, sec^2}{ft}$ |
| Ultimate Resistance-with gravity effects | $Ru = 3356.72\, lb$ |
| Equivalent Elastic Deflection | $Xe = 0.04\, ft$ |
| Elastic Stiffness | $Ke = 83460.9 \frac{lb}{ft}$ |
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 290.74\, Hz$ |
| Period of Vibration | $T = 0.0216\, sec$ |
| Dead Load Displacement | $Xdl = 0.0063\, in$ |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.940 \cdot lb \cdot in^{-2}$ |
| Incident Impulse | $Is := 26.43 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1324 \cdot \frac{ft}{sec}$ |



LIMITED OFFICIAL USE

HE

San Francisco, California 94103

Date 1/24/2003

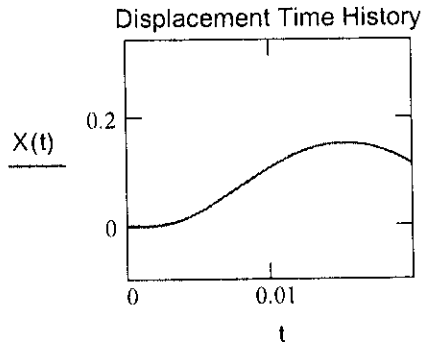
Rise Time $tr = 4.53\,msec$

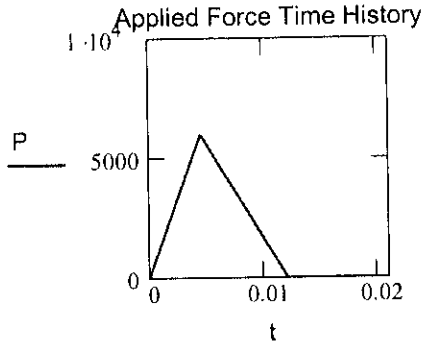
Equivalent Duration $td = 12.15\,msec$

Total Force $F1 = 5996.16\,lb$

RESPONSE

Equivalent Mass $Me = 0.99\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement $Xd = 1.85\,in$

Maximum Displacement $Xm = 1.86\,in$

Peak Support Rotation $\theta = 2.96\,deg$ <4 deg => OK

Ductility $\mu = 3.8$ < 6 => OK

Applied Shear $Vu = 1678.36\,lb$

Deck Shear Area $Av = 0.38\,in^2$

Ultimate Simple Shear $V_{deck} = 9349.86\,lb$

Shear Ratio $\lambda_V = 5.57$ > 1 => OK

RESISTANCE TO JOIST

Resistance per foot $Ruft = 3356.72\,\frac{lb}{ft}$



LIMITED OFFICIAL USE

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356,357,358
Roof Metal Deck Type W2" **NG**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

W2 formlock

| | | | |
|---|---|---|---|
| Thickness (18 ga.) | $t_{deck} := 0.0478 \cdot in$ | Deck Yield Strength | $fy := 33400 \cdot lb \cdot in^{-2}$ |
| Span Length | $L := 8 \cdot ft$ | Modulus of Elasticity | $E := 29000000 \cdot lb \cdot in^{-2}$ |
| Moment of Inertia | $I := 0.555 \cdot in^4$ | Steel Wt Density | $\gamma_s := 490 \cdot lb \cdot ft^{-3}$ |
| Modulus of Elasticity | $Z := 0.510 \cdot in^3$ | Depth of decking | $h := 2 \cdot in$ |
| Exposed width | $b := 12 \cdot in$ | Live load | $LL := 20 \cdot \frac{lb}{ft^2}$ |
| Number of vertical sections in 12" section | $Nl := 2$ | | |
| Effective width | $s := 14.47 \cdot in$ | | |
| Dynamic Increase Factor | $c := 1.1$ | | |
| Avg. Strength Increase | $a := 1.21$ | | |

Effective width is the flattened distance.
top and bottom flat sections, and 2 vertical sections.

Dynamic Yield Strength of deck $fdy := c \cdot a \cdot fy$ $fdy = 44455.4\, lb \cdot in^{-2}$

| | |
|---|---|
| Ultimate Moment | $Mu = 1889.35\, lb\, ft$ |
| Ultimate Resistance-no gravity effects | $Rut = 2834.03\, lb$ |
| Total Mass | $wd = 2.35 \frac{lb}{ft^2}$ |
| | $M = 1.83 \frac{lb\, sec^2}{ft}$ |
| Ultimate Resistance-with gravity effects | $Ru = 2491.8\, lb$ |
| Equivalent Elastic Deflection | $Xe = 0.07\, ft$ |
| Elastic Stiffness | $Ke = 35210.07 \frac{lb}{ft}$ |
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 163.54\, Hz$ |
| Period of Vibration | $T = 0.0384\, sec$ |
| Dead Load Displacement | $Xdl = 0.02\, in$ |

LOAD TIME HISTORY

| | |
|---|---|
| Incident Pressure | $Ps := 6.940 \cdot lb \cdot in^{-2}$ |
| Incident Impulse | $Is := 26.43 \cdot psi \cdot msec$ |
| Shock Front Velocity | $U := 1324 \cdot \frac{ft}{sec}$ |

Rise Time $tr = 6.04\,msec$

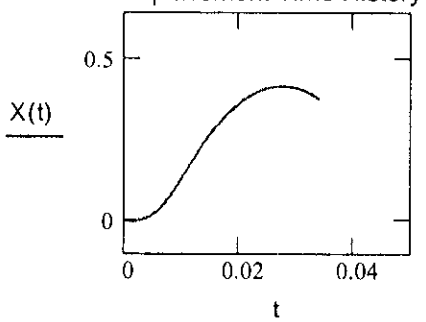
Equivalent Duration $td = 13.66\,msec$

Total Force $F1 = 7994.88\,lb$

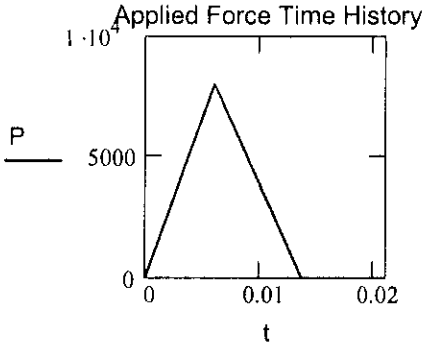
RESPONSE

Equivalent Mass $Me = 1.32\,\frac{lb\,sec^2}{ft}$

Displacement Time History




Applied Force Time History




Dynamic Displacement $Xd = 5.01\,in$

Maximum Displacement $Xm = 5.03\,in$

Peak Support Rotation $\theta = 5.99\,deg$ >4 deg => NG

Ductility $\mu = 5.79$ < 6 => OK

Applied Shear $Vu = 1245.9\,lb$

Deck Shear Area $Av = 0.38\,in^2$

Ultimate Simple Shear $V_{deck} = 9349.86\,lb$

Shear Ratio $\lambda_v = 7.5$ > 1 => OK

RESISTANCE TO JOIST

Resistance per foot $Ruft = 2491.8\,\frac{lb}{ft}$

HE

Date 1/24/2003

San Francisco, California 94103

Schofield Barracks 3A
Building 356,357,358
Roof Metal Deck Type N 3" **OK**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

N formlock

| | | | |
|---|---|---|---|
| Thickness (18 ga.) | $t_{deck} := 0.0478 \cdot in$ | Pan Yield Strength | $fy := 33400 \cdot lb \cdot in^{-2}$ |
| Span Length | $L := 8 \cdot ft$ | Modulus of Elasticity | $E := 29000000 \cdot lb \cdot in^{-2}$ |
| Moment of Inertia | $I := 1.146 \cdot in^4$ | Steel Wt Density | $\gamma_s := 490 \cdot lb \cdot ft^{-3}$ |
| Modulus of Elasticity | $Z := 0.664 \cdot in^3$ | Depth of decking | $h := 3 \cdot in$ |
| Exposed width | $b := 12 \cdot in$ | Plate Thickness | $tp := 0 \cdot in$ |
| Number of vertical sections in 12" section | $Nl := 4$ | Live load | $LL := 20 \cdot \frac{lb}{ft^2}$ |
| Effective width | $s := 17.29 \cdot in$ | | |
| Dynamic Increase Factor | $c := 1.1$ | | |
| Avg. Strength Increase | $a := 1.21$ | | |

Effective width is the flattened distance.
2 top flat sections, 2 bottom flat sections,
and 4 vertical sections.

Dynamic Yield Strength of Pan $fdy := c \cdot a \cdot fy$ $fdy = 44455.4\, lb \cdot in^{-2}$

Ultimate Moment $Mu = 2459.87\, lb\, ft$

Ultimate Resistance-no gravity effects $Rut = 3689.8\, lb$

Total Mass $wd = 2.81 \frac{lb}{ft^2}$

$M = 1.94 \frac{lb\, sec^2}{ft}$

Ultimate Resistance-with gravity effects $Ru = 3258.32\, lb$

Equivalent Elastic Deflection $Xe = 0.04\, ft$

Elastic Stiffness $Ke = 72704.03 \frac{lb}{ft}$

Load Mass Factor $Klm := 0.72$

Circular Frequency $\omega = 228\, Hz$

Period of Vibration $T = 0.0276\, sec$

Dead Load Displacement $Xdl = 0.0103\, in$

LOAD TIME HISTORY

Incident Pressure $Ps := 6.940 \cdot lb \cdot in^{-2}$

Incident Impulse $Is := 26.43 \cdot psi \cdot msec$

Shock Front Velocity $U := 1324 \cdot \frac{ft}{sec}$

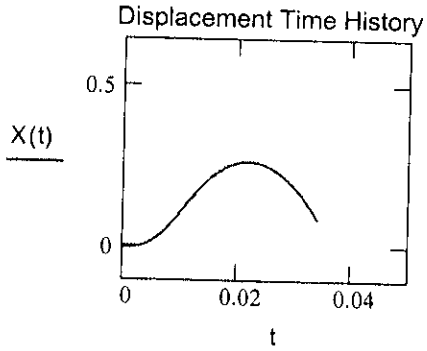
Rise Time $tr = 6.04\,msec$

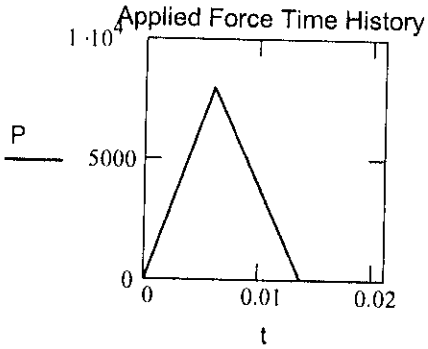
Equivalent Duration $td = 13.66\,msec$

Total Force $F1 = 7994.88\,lb$

RESPONSE

Equivalent Mass $Me = 1.4\,\frac{lb\,sec^2}{ft}$




Dynamic Displacement

Maximum Displacement $Xd = 3.2\,in$

Peak Support Rotation $Xm = 3.21\,in$

$\theta = 3.82\,deg$ 4 deg => OK

Ductility

$\mu = 5.85$ < 6 => OK

Applied Shear

Deck Shear Area $Vu = 1629.16\,lb$

Ultimate Simple Shear $Av = 1.15\,in^2$

$V_{deck} = 28049.58\,lb$

Shear Ratio

$\lambda_V = 17.22$ > 1 => OK

RESISTANCE TO JOIST

Resistance per foot $Ruft = 3258.32\,\frac{lb}{ft}$

HE

Date 1/24/2003

San Francisco, California 94103

Building 355
2nd Floor Exterior Corridor
Slab downward (3rd floor ok by inspection)

vc

| | | | |
|---|---|---|---|
| Slab Thickness | $h := 4 \cdot in$ | Concrete Strength | $fc := 2500 \cdot lb \cdot in^{-2}$ |
| Span Length | $L := 10.83 \cdot ft$ | Steel Strength | $fy := 40000 \cdot lb \cdot in^{-2}$ |
| Wire Mesh Diameter | $db := 0.244 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Wire Spacing | $s := 2 \cdot in$ | Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Cover Depth | $c := 0.75 \cdot in$ | Concrete Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ | | $Ec = 4.1 \times 10^{8}\, lb\, ft^{-2}$ |

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | | $DIFs := 1.17$ |
| Concrete DIF | | $DIFc := 1.19$ |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Steel | $As = 0.047\, in^2$ (Clinton Wire Mesh) |
| Tension Steel Centroid | $yt = 0.87\, in$ |
| Effective Depth | $d = 3.13\, in$ |
| Gross Mom. of Inertia | $Ig = 10.67\, in^4$ |
| Conc. Elastic Modulus | $Ec = 2.85 \times 10^{6}\, lb \cdot in^{-2}$ |
| Steel Percentage | $\rho = 0.0075$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.99\, in$ |
| Cracked Mom. of Inertia | $Ic = 2.83\, in^4$ |
| Avg. Mom. of Inertia | $Ia = 6.75\, in^4$ |

**Model Properties**

| | | |
|---|---|---|
| Weight | $Wt = 112.81\,lb$ | |
| Mass | $M = 3.51\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 530.97\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 8073.85\,\frac{lb}{ft}$ | (Biggs Table 5.1) |
| Ultimate Resistance | $Ru = 279.41\,lb$ | |
| Elastic Limit Displacement | $Xe = 0.42\,in$ | |
| Dead Load Displacement | $Xdl = 0.17\,in$ | |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 56.55\,Hz$ |
| Period of Vibration | $T = 0.11\,sec$ |
| Equivalent Mass | $Me = 2.52\,\frac{lb\,sec^2}{ft}$ |

**Basic Loading Parameters**

| | | |
|---|---|---|
| Peak Incident Pressure without Reductions | $Pr := 2.427 \cdot psi$ | |
| Incident Impulse without Reductions | $I := 14.29 \cdot psi \cdot msec$ | |
| Total Load Duration | $td = 8.83\,msec$ | |
| Total Force without Reductions | $F1t = 630.83\,lb$ | |

**No Load Reductions : Set LUWA Reduction Factor = 1**

| | | |
|---|---|---|
| LUWA Reduction Factor | $rf := 1$ | (Exterior Corridor) |
| Reduced Pressure | $Pre = 2.43\,psi$ | |
| Total Duration | $td = 8.83\,msec$ | |
| Rise Time | $tr = 2.94\,msec$ | |

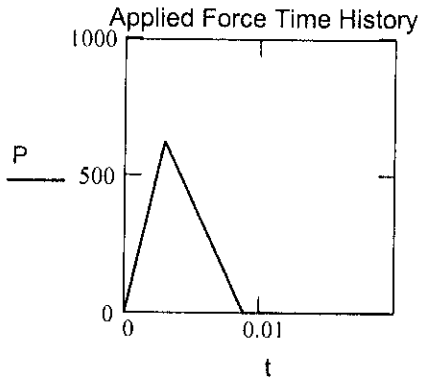
Decay Time $tp = 5.89\,msec$

Total Force $F1 = 630.83\,lb$

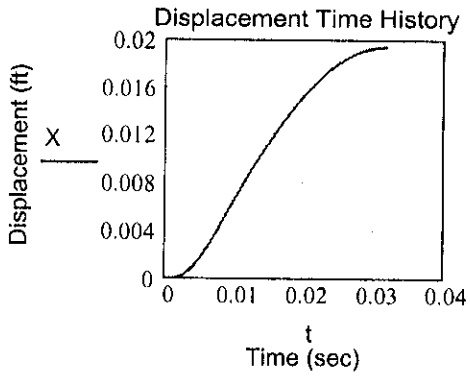
Response Ratios $\frac{td}{T} = 0.08$ $\frac{Ru}{F1} = 0.44$

**Load Time History for Internal Pressure**

Applied Load




**Results**




Dynamic Displacement $Xd = 0.23\,in$

Maximum Displacement $Xm = 0.4\,in$

Peak Support Rotation $\theta = 0.21\,deg$ < 2 deg => OK

Ductility $\mu = 0.4$ < 15 => OK

**Shear Calcs**

Shear Capacity $Vc = 682.45\,lb$

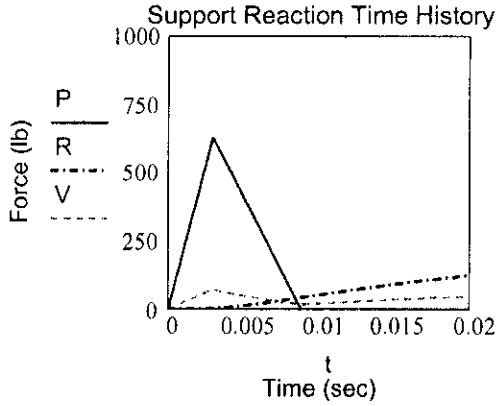
Ultimate Applied Shear $Vu = 196.11\,lb$

Shear Ratio $\lambda = 3.48$ > 1 => OK

Reaction to Beams $Vb = 1176.68\,\frac{lb}{ft}$

**Connection Loads (simple-simple)**

Max Reaction $Vm := \max(V)$ $Vm = 69.91\,lb$




Connection Load Comparisons

Peak Dynamic $Pconn1 = 358.49\,\frac{lb}{ft}$

Upper Bound Dynamic $Pconn2 = 914.68\,\frac{lb}{ft}$

Ultimate Static $Pconn3 = 1005.71\,\frac{lb}{ft}$ (governs)

$Pmax := \max(Pconn1, Pconn2, Pconn3)$ $Pmax = 1005.71\,\frac{lb}{ft}$

$Pmin := \min(Pconn1, Pconn2, Pconn3)$ $Pmin = 358.49\,\frac{lb}{ft}$

HE

Date 1/24/2003

San Francisco, California 94103

Building 356
2nd Floor Interior
Slab downward OK

vc

| | | | | |
|---|---|---|---|---|
| Slab Thickness | $h := 6 \cdot in$ | Concrete Strength | $fc := 2500 \cdot lb \cdot in^{-2}$ | $psi := lb \cdot in^{-2}$ |
| Span Length | $L := 15.58 \cdot ft$ | Steel Strength | $fy := 40000 \cdot lb \cdot in^{-2}$ | $msec := \frac{sec}{1000}$ |
| Wire Mesh Diameter | $db := 0.244 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ | |
| Wire Spacing | $s := 2 \cdot in$ | Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ | |
| Cover Depth | $c := 0.75 \cdot in$ | Concrete Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ | |
| Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ | | $Ec = 4.1 \times 10^{8}\, lb\, ft^{-2}$ | |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | | $DIFs := 1.17$ |
| Concrete DIF | | $DIFc := 1.19$ |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Steel | $As = 0.047\, in^2$ (Clinton Wire Mesh) |
| Tension Steel Centroid | $yt = 0.87\, in$ |
| Effective Depth | $d = 5.13\, in$ |
| Gross Mom. of Inertia | $Ig = 36\, in^4$ |
| Conc. Elastic Modulus | $Ec = 2.85 \times 10^{6}\, lb \cdot in^{-2}$ |
| Steel Percentage | $\rho = 0.0046$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 1.28\, in$ |
| Cracked Mom. of Inertia | $Ic = 8.51\, in^4$ |
| Avg. Mom. of Inertia | $Ia = 22.26\, in^4$ |

**Model Properties**

| | | |
|---|---|---|
| Weight | $Wt = 227.21\,lb$ | |
| Mass | $M = 7.06\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 895.7\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 8945.69\,\frac{lb}{ft}$ | (Biggs Table 5.1) |
| Ultimate Resistance | $Ru = 232.71\,lb$ | |
| Elastic Limit Displacement | $Xe = 0.31\,in$ | |
| Dead Load Displacement | $Xdl = 0.3\,in$ | |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 41.95\,Hz$ |
| Period of Vibration | $T = 0.15\,sec$ |
| Equivalent Mass | $Me = 5.08\,\frac{lb\,sec^2}{ft}$ |

**Basic Loading Parameters**

| | | |
|---|---|---|
| Peak Incident Pressure without Reductions | $Pr := 2.427 \cdot psi$ | |
| Incident Impulse without Reductions | $I := 14.29 \cdot psi \cdot msec$ | |
| Total Load Duration | $td = 3.1\,msec$ | |
| Total Force without Reductions | $F1t = 17791.11\,lb$ | |

**No Load Reductions : Set LUWA Reduction Factor = 1**

| | | |
|---|---|---|
| LUWA Reduction Factor | $rf := 1$ | (Exterior Corridor) |
| Reduced Pressure | $Pre = 29.02\,psi$ | |
| Total Duration | $td = 3.1\,msec$ | |
| Rise Time | $tr = 1.03\,msec$ | |

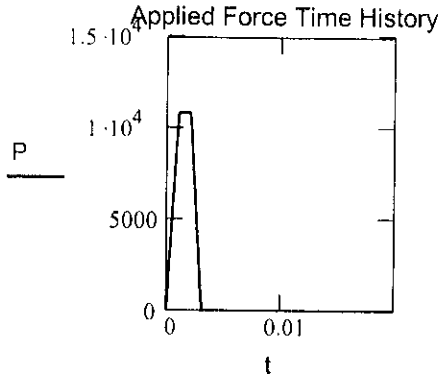
Decay Time $tp = 2.07\,msec$

Total Force $F1 = 10852.58\,lb$

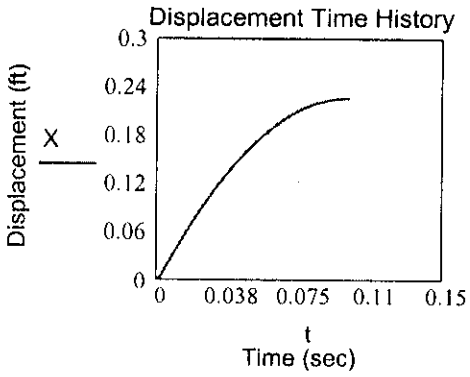
Response Ratios $\frac{td}{T} = 0.02$ $\frac{Ru}{F1} = 0.02$

**Load Time History for Internal Pressure**

Applied Load




**Results**




Dynamic Displacement $Xd = 2.71\,in$

Maximum Displacement $Xm = 3.02\,in$

Peak Support Rotation $\theta = 1.66\,deg$ < 2 deg => OK

Ductility $\mu = 4.4$ < 15 => OK

**Shear Calcs**

Shear Capacity $Vc = 1118.8\,lb$

Ultimate Applied Shear $Vu = 229.96\,lb$

Shear Ratio $\lambda = 4.87$ > 1 => OK

Reaction to Beams $Vb = 1379.77\,\frac{lb}{ft}$

HE

Date 1/24/2003

San Francisco, California 94103

Building 356
3rd Floor Interior
Slab downward

vc

| | | | | |
|---|---|---|---|---|
| Slab Thickness | $h := 6 \cdot in$ | Concrete Strength | $fc := 2500 \cdot lb \cdot in^{-2}$ | $psi := lb \cdot in^{-2}$ |
| Span Length | $L := 15.66 \cdot ft$ | Steel Strength | $fy := 40000 \cdot lb \cdot in^{-2}$ | $msec := \frac{sec}{1000}$ |
| Wire Mesh Diameter | $db := 0.244 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ | |
| Wire Spacing | $s := 2 \cdot in$ | Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ | |
| Cover Depth | $c := 0.75 \cdot in$ | Concrete Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ | |
| Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ | | | |

$Ec = 4.1 \times 10^{8}\, lb\, ft^{-2}$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | | $DIFs := 1.17$ |
| Concrete DIF | | $DIFc := 1.19$ |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Steel | $As = 0.047\, in^2$ (Clinton Wire Mesh) |
| Tension Steel Centroid | $yt = 0.87\, in$ |
| Effective Depth | $d = 5.13\, in$ |
| Gross Mom. of Inertia | $Ig = 36\, in^4$ |
| Conc. Elastic Modulus | $Ec = 2.85 \times 10^{6}\, lb \cdot in^{-2}$ |
| Steel Percentage | $\rho = 0.0046$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 1.28\, in$ |
| Cracked Mom. of Inertia | $Ic = 8.51\, in^4$ |
| Avg. Mom. of Inertia | $Ia = 22.26\, in^4$ |

**Model Properties**

| | | |
|---|---|---|
| Weight | $Wt = 228.37\,lb$ | |
| Mass | $M = 7.1\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 895.7\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 8809.29\,\frac{lb}{ft}$ | (Biggs Table 5.1) |
| Ultimate Resistance | $Ru = 229.2\,lb$ | |
| Elastic Limit Displacement | $Xe = 0.31\,in$ | |
| Dead Load Displacement | $Xdl = 0.31\,in$ | |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | $Klm := 0.72$ |
| Circular Frequency | $\omega = 41.52\,Hz$ |
| Period of Vibration | $T = 0.15\,sec$ |
| Equivalent Mass | $Me = 5.11\,\frac{lb\,sec^2}{ft}$ |

**Basic Loading Parameters**

| | | |
|---|---|---|
| Peak Incident Pressure without Reductions | $Pr := 17.75 \cdot psi$ | |
| Incident Impulse without Reductions | $I := 40.12 \cdot psi \cdot msec$ | |
| Total Load Duration | $td = 4.52\,msec$ | |
| Total Force without Reductions | $F1t = 6671.16\,lb$ | |

**LUWA Reduction Factor due to Window opening**

| | | |
|---|---|---|
| LUWA Reduction Factor | $rf := 0.75$ | (Window height= 6'-6") (Room height= 12'-1") |
| Reduced Pressure | $Pre = 13.31\,psi$ | |
| Total Duration | $td = 4.52\,msec$ | |

Rise Time $tr = 1.51\,msec$

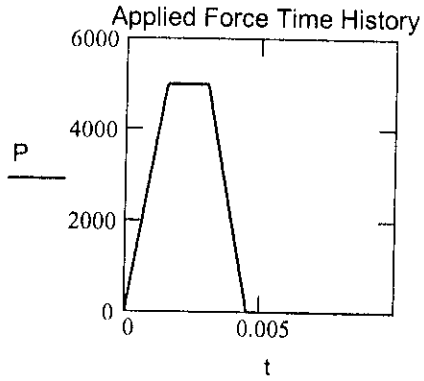
Decay Time $tp = 3.01\,msec$

Total Force $F1 = 5003.37\,lb$

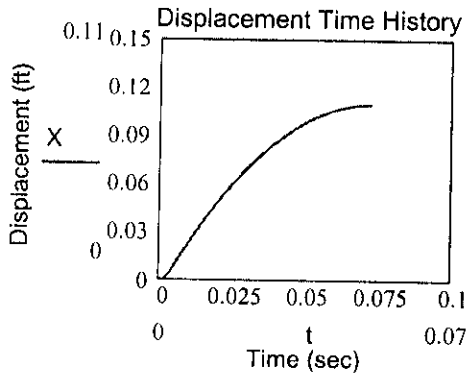
Response Ratios $\frac{td}{T} = 0.03$ $\frac{Ru}{F1} = 0.05$

**Load Time History for Internal Pressure**

Applied Load




**Results**




Dynamic Displacement $Xd = 1.32\,in$

Maximum Displacement $Xm = 1.63\,in$

Peak Support Rotation $\theta = 0.8\,deg$ < 2 deg => OK

Ductility $\mu = 2.12$ < 15 => OK

**Shear Calcs**

Shear Capacity $Vc = 1118.8\,lb$

Ultimate Applied Shear $Vu = 228.79\,lb$

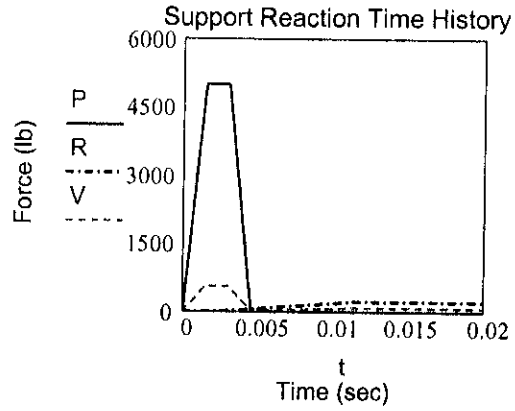
Shear Ratio $\lambda = 4.89$ > 1 => OK

Reaction to Beams $Vb = 1372.72\,\frac{lb}{ft}$

**Connection Loads (simple-simple)**

No. of time steps used $jend = 140$

Max Reaction $Vm := \max(V)$ $Vm = 559.06\,lb$




Connection Load Comparisons

Peak Dynamic $Pconn1 = 2866.96\,\frac{lb}{ft}$

Upper Bound Dynamic $Pconn2 = 3280.81\,\frac{lb}{ft}$ (gover

Ultimate Static $Pconn3 = 1173.26\,\frac{lb}{ft}$

$Pmax := \max(Pconn1, Pconn2, Pconn3)$ $Pmax = 3280.81\,\frac{lb}{ft}$

$Pmin := \min(Pconn1, Pconn2, Pconn3)$ $Pmin = 1173.26\,\frac{lb}{ft}$

Building 355
Exterior Concrete Wall
Breeze - 1st Floor **NG (standoff 25.4')**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple supports) |
| Ultimate Resistance | $Ru = 1484.49\,lb$ | |
| Elastic Limit Displacement | $Xe = 0.04\,in$ | |

PERIOD OF VIBRATION

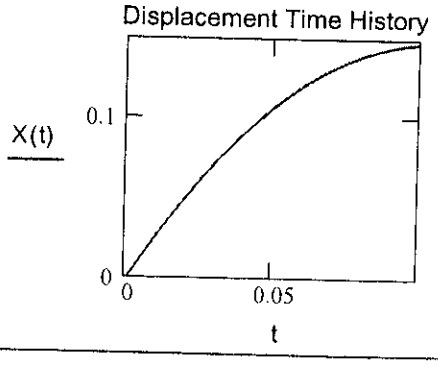
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .72$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 91.84\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

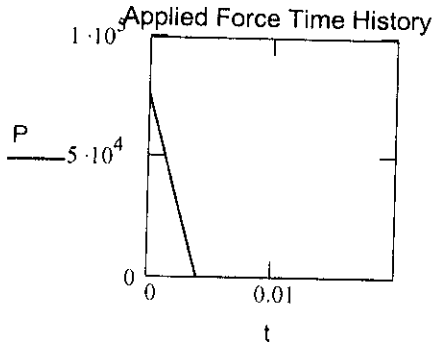
LOAD TIME HISTORY

| | |
|---|---|
| Peak Incident Pressure | $Pr := 21.90 \cdot psi$ |
| Peak Incident Impulse | $Ir := 43.73 \cdot psi \cdot msec$ |
| Load Duration | $td = 3.994\,msec$ |
| Total Load | $F1 = 76317.12\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.06$ | $\frac{Ru}{F1} = 0.02$ |
| Equivalent Mass | $Me = 54.16\,\frac{lb\,sec^2}{ft}$ | |



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| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 1.78\,in$ | | |
| Displacement Ductility | $\mu = 45.52$ | >15 => NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 1.4\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied Shear | $Va = 742.24\,lb$ | | |
| Shear capacity | $Vc = 1.7 \times 10^4\,lb$ | >Va => NG | |

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Building 355
Exterior Concrete Wall
Breeze - 1st Floor **OK with 50' range**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

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MODEL PROPERTIES

Wall Weight $Wt = 2420\,lb$

Total Mass $M = 75.22\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 2245.29\,lb\,ft$

Elastic Stiffness $Ke = 456826.59\,\frac{lb}{ft}$ (simple supports)

Ultimate Resistance $Ru = 1484.49\,lb$

Elastic Limit Displacement $Xe = 0.04\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .72$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 91.84\,Hz$

Circular Frequency $T = 0.07\,sec$

LOAD TIME HISTORY

Peak Incident Pressure $Pr := 5.82 \cdot psi$

Peak Incident Impulse $Ir := 24.18 \cdot psi \cdot msec$

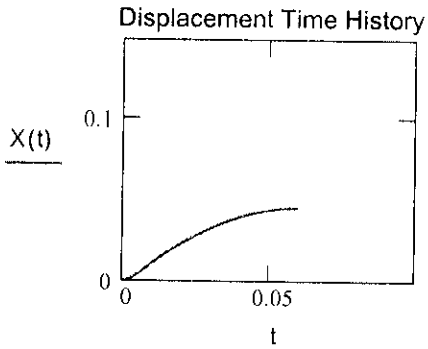
Load Duration $td = 8.309\,msec$

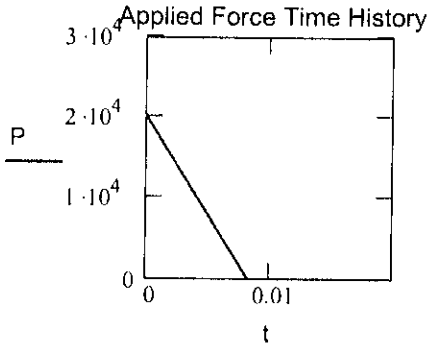
Total Load $F1 = 20281.54\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.12$ $\frac{Ru}{F1} = 0.07$

Equivalent Mass $Me = 54.16\,\frac{lb\,sec^2}{ft}$




| | | | |
|---|---|---|---|
| Maximum Displacement | | $Xm = 0.54\,in$ | |
| Displacement Ductility | $\mu := \frac{Xm}{Xe}$ | $\mu = 13.96$ | <15 => OK (per FBO Criteria 3/00) |
| Peak Support Rotation | | $\theta = 0.43\,deg$ | <2 deg => OK (per TM5-853 Vol.2) |
| Applied shear | $Va := \frac{Ru}{2}$ | $Va = 742.24\,lb$ | |
| Shear capacity | | $Vc = 1.7 \times 10^4\,lb$ | >Va => OK |

Building 355
Exterior Concrete Wall
Quad Side - 1st Floor **OK**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

Wall Weight $Wt = 2420\,lb$

Total Mass $M = 75.22\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 2245.29\,lb\,ft$

Elastic Stiffness $Ke = 456826.59\,\frac{lb}{ft}$ (simple and fixed ends)

Ultimate Resistance $Ru = 2226.73\,lb$ (elastic plastic)

Elastic Limit Displacement $Xe = 0.06\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .78$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 88.24\,Hz$

Circular Frequency $T = 0.07\,sec$

LOAD TIME HISTORY

Peak Incident Pressure $Pr := 2.463 \cdot psi$

Peak Incident Impulse $Ir := 14.44 \cdot psi \cdot msec$

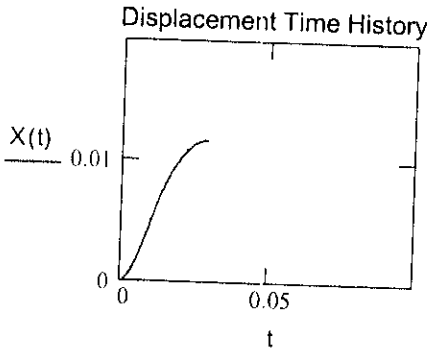
Load Duration $td = 11.726\,msec$

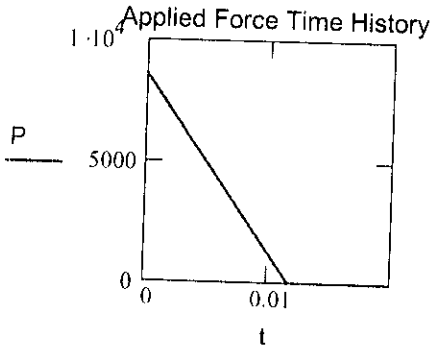
Total Load $F1 = 8583.06\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.16$ $\frac{Ru}{F1} = 0.26$

Equivalent Mass $Me = 58.67\,\frac{lb\,sec^2}{ft}$




| | | |
|---|---|---|
| Maximum Displacement | $Xm = 0.14\,in$ | |
| Displacement Ductility | $\mu = 2.41$ | <15 => OK (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 0.11\,deg$ | <2 deg => OK (per TM5-853 Vol.2) |
| Applied shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

San Francisco, California 94103

Building 355
Exterior Concrete Wall
3rd floor -Quad Side **OK**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03 in^2$ |
| Centroid Depth | $yt = 3 in$ |
| Effective Depths | $d = 3 in$ |
| Gross Mom. of Inertia | $Ig = 108 in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51 in$ |
| Cracked Mom. of Inertia | $Ic = 2.03 in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02 in^4$ |

MODEL PROPERTIES

Wall Weight $Wt = 453.75\,lb$

Total Mass $M = 14.1\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 345\,lb\,ft$

Elastic Stiffness $Ke = 47204.01\,\frac{lb}{ft}$ (simple and fixed ends)

Ultimate Resistance $Ru = 342.15\,lb$ (elastic plastic)

Elastic Limit Displacement $Xe = 0.09\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .78$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 65.51\,Hz$

Circular Frequency $T = 0.1\,sec$

LOAD TIME HISTORY

Peak Incident Pressure $Pr := 2.326 \cdot psi$

Peak Incident Impulse $Ir := 13.88 \cdot psi \cdot msec$

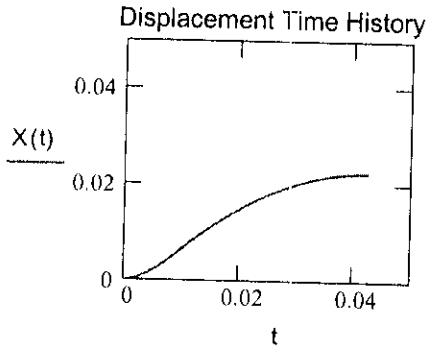
Load Duration $td = 11.935\,msec$

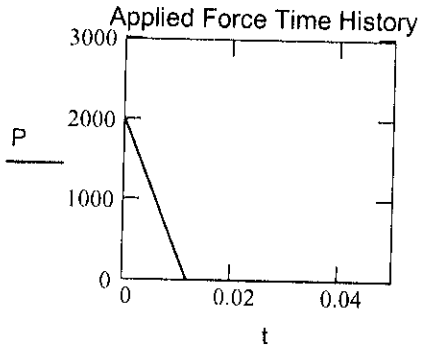
Total Load $F1 = 2026.41\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.12$ $\frac{Ru}{F1} = 0.17$

Equivalent Mass $Me = 11\,\frac{lb\,sec^2}{ft}$




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 0.27\,in$ | | |
| Displacement Ductility | $\mu = 3.14$ | <15 => OK | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 0.22\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied shear | $Va = 171.07\,lb$ | | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK | |

San Francisco, California 94103

Building 355
Exterior Concrete Wall
Short Side - 1st Floor **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

Wall Weight $Wt = 2420\,lb$

Total Mass $M = 75.22\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 2245.29\,lb\,ft$

Elastic Stiffness $Ke = 456826.59\,\frac{lb}{ft}$ (simple and fixed ends)

Ultimate Resistance $Ru = 2226.73\,lb$ (elastic plastic)

Elastic Limit Displacement $Xe = 0.06\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .78$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 88.24\,Hz$

Circular Frequency $T = 0.07\,sec$

LOAD TIME HISTORY

Peak Incident Pressure $Pr := 21.90 \cdot psi$

Peak Incident Impulse $Ir := 43.73 \cdot psi \cdot msec$

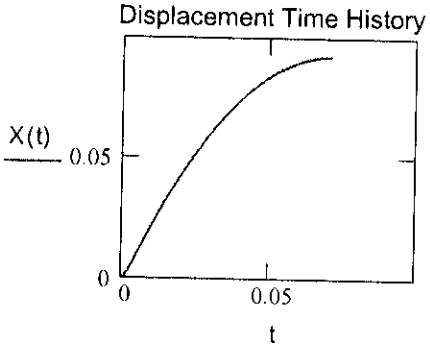
Load Duration $td = 3.994\,msec$

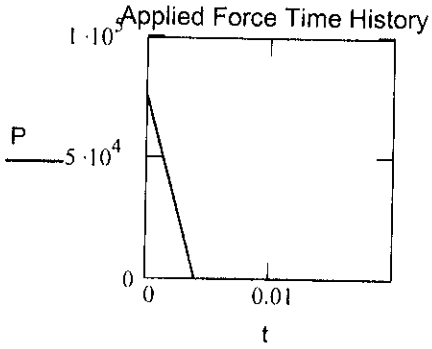
Total Load $F1 = 76317.12\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.06$ $\frac{Ru}{F1} = 0.03$

Equivalent Mass $Me = 58.67\,\frac{lb\,sec^2}{ft}$




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 1.11\,in$ | | |
| Displacement Ductility | $\mu = 18.97$ | >15 =>NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 0.88\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied Shear | $Va = 1.11 \times 10^3\,lb$ | | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK | |

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Building 355
Exterior Concrete Wall
3rd floor - Short Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03 in^2$ |
| Centroid Depth | $yt = 3 in$ |
| Effective Depths | $d = 3 in$ |
| Gross Mom. of Inertia | $Ig = 108 in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51 in$ |
| Cracked Mom. of Inertia | $Ic = 2.03 in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02 in^4$ |

MODEL PROPERTIES

Wall Weight $Wt = 453.75\,lb$

Total Mass $M = 14.1\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 345\,lb\,ft$

Elastic Stiffness $Ke = 47204.01\,\frac{lb}{ft}$ (simple and fixed ends)

Ultimate Resistance $Ru = 342.15\,lb$ (elastic plastic)

Elastic Limit Displacement $Xe = 0.09\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .78$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 65.51\,Hz$

Circular Frequency $T = 0.1\,sec$

LOAD TIME HISTORY

Peak Incident Pressure $Pr := 10.76 \cdot psi$

Peak Incident Impulse $Ir := 32.42 \cdot psi \cdot msec$

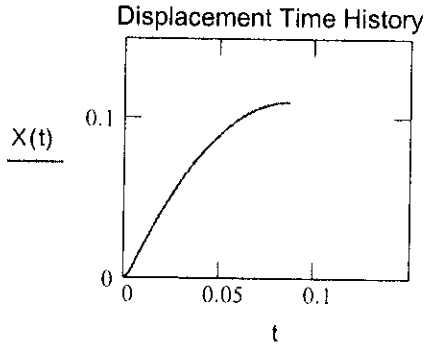
Load Duration $td = 6.026\,msec$

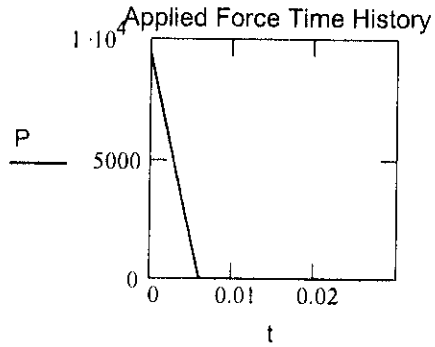
Total Load $F1 = 9374.11\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.06$ $\frac{Ru}{F1} = 0.04$

Equivalent Mass $Me = 11\,\frac{lb\,sec^2}{ft}$




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 1.33\,in$ | | |
| Displacement Ductility | $\mu = 15.29$ | >15 => NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 1.05\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied Shear | $Va = 171.07\,lb$ | | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK | |

San Francisco, California 94103

Building 356
Exterior Concrete Wall
Short Side - 2nd Floor **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

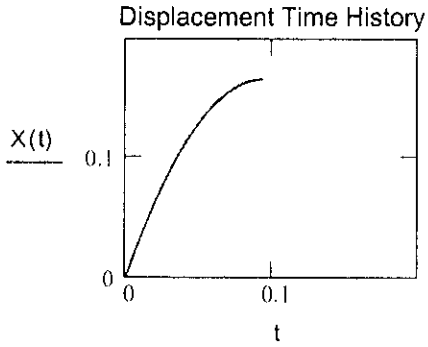
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

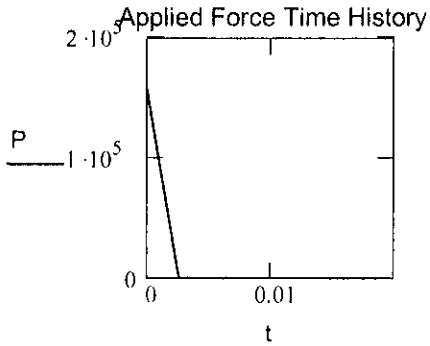
LOAD TIME HISTORY

| | |
|---|---|
| Peak Incident Pressure | $Pr := 45.29 \cdot psi$ |
| Peak Incident Impulse | $Ir := 58.86 \cdot psi \cdot msec$ |
| Load Duration | $td = 2.599\,msec$ |
| Total Load | $F1 = 157826.59\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.04$ | $\frac{Ru}{F1} = 0.01$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |




| | | |
|---|---|---|
| Maximum Displacement | $Xm = 1.99\,in$ | |
| Displacement Ductility | $\mu = 34.1$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 1.57\,deg$ | <2 deg => OK (per TM5-853 Vol.2) |
| Applied Shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

Building 356
Exterior Concrete Wall
3rd floor - Short Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6}\, lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03\, in^2$ |
| Centroid Depth | $yt = 3\, in$ |
| Effective Depths | $d = 3\, in$ |
| Gross Mom. of Inertia | $Ig = 108\, in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51\, in$ |
| Cracked Mom. of Inertia | $Ic = 2.03\, in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02\, in^4$ |

San Francisco, California 94103

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 453.75\,lb$ | |
| Total Mass | $M = 14.1\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 345\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 47204.01\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 342.15\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.09\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 65.51\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

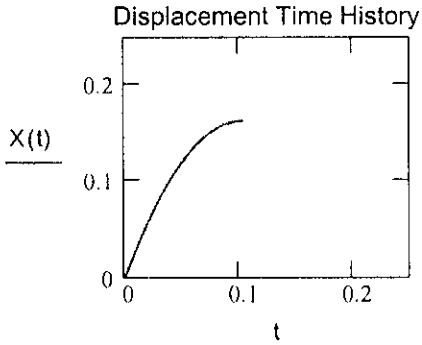
LOAD TIME HISTORY

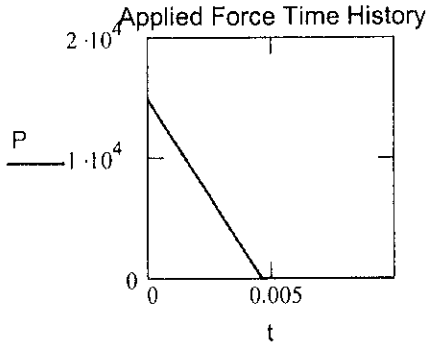
| | |
|---|---|
| Peak Incident Pressure | $Pr := 17.05 \cdot psi$ |
| Peak Incident Impulse | $Ir := 39.45 \cdot psi \cdot msec$ |
| Load Duration | $td = 4.628\,msec$ |
| Total Load | $F1 = 14853.96\,lb$ |

RESPONSE

Response Ratios $\frac{td}{T} = 0.05$ $\frac{Ru}{F1} = 0.02$

Equivalent Mass $Me = 11\,\frac{lb\,sec^2}{ft}$




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 1.95\,in$ | | |
| Displacement Ductility | $\mu = 22.47$ | >15 => NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 1.54\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied Shear | $Va = 171.07\,lb$ | | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK | |

San Francisco, California 94103

Building 356
Exterior Concrete Wall
1st floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Number of Legs | $nv := 1$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

San Francisco, California 94103

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

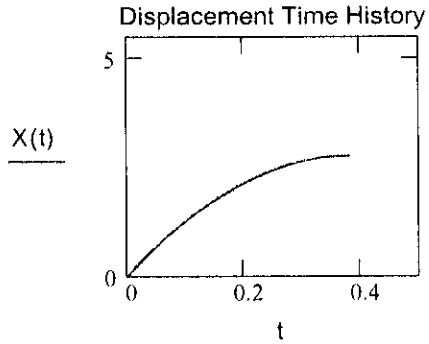
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

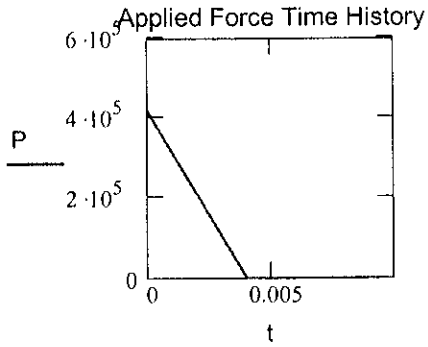
LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 120 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 241.5 \cdot psi \cdot msec$ |
| Load Duration | $td = 4.025\,msec$ |
| Total Load | $F1 = 418176\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.06$ | $\frac{Ru}{F1} = 5.32 \times 10^{-3}$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |




| | | |
|---|---|---|
| Maximum Displacement | $Xm = 33.09\,in$ | |
| Displacement Ductility | $\mu = 565.7$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 24.5\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

This wall fails for pressure of 120 psi. But at a range of 13.4', the pressure is 453.5 psi. Therefore the wall will fail.

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Building 356
Exterior Concrete Wall
2nd floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Number of Legs | $nv := 1$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

Wall Weight $Wt = 2420\,lb$

Total Mass $M = 75.22\,\frac{lb\,sec^2}{ft}$

Ultimate Moment $Mu = 2245.29\,lb\,ft$

Elastic Stiffness $Ke = 456826.59\,\frac{lb}{ft}$ (simple and fixed ends)

Ultimate Resistance $Ru = 2226.73\,lb$ (elastic plastic)

Elastic Limit Displacement $Xe = 0.06\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .78$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 88.24\,Hz$

Circular Frequency $T = 0.07\,sec$

LOAD TIME HISTORY

Peak Reflective Pressure $Pr := 173.5 \cdot psi$

Peak Reflective Impulse $Ir := 162.2 \cdot psi \cdot msec$

Load Duration $td = 1.87\,msec$

Total Load $F1 = 604612.8\,lb$

RESPONSE

Response Ratios $\frac{td}{T} = 0.03$ $\frac{Ru}{F1} = 3.68 \times 10^{-3}$

Equivalent Mass $Me = 58.67\,\frac{lb\,sec^2}{ft}$

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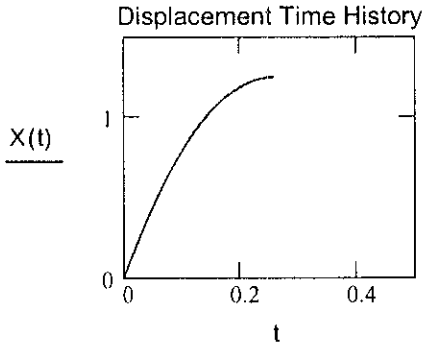


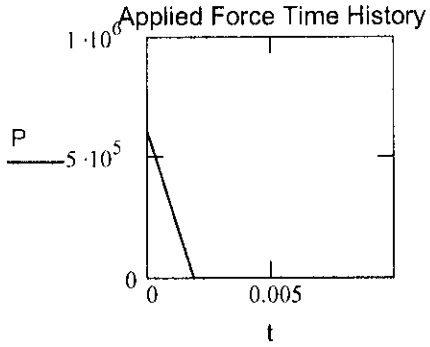


| | | |
|---|---|---|
| Maximum Displacement | $Xm = 14.98\,in$ | |
| Displacement Ductility | $\mu = 256.05$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 11.66\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

HE

San Francisco, California 94103

Building 356
Exterior Concrete Wall
3rd floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6}\, lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03\, in^2$ |
| Centroid Depth | $yt = 3\, in$ |
| Effective Depths | $d = 3\, in$ |
| Gross Mom. of Inertia | $Ig = 108\, in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51\, in$ |
| Cracked Mom. of Inertia | $Ic = 2.03\, in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02\, in^4$ |

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MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 453.75\,lb$ | |
| Total Mass | $M = 14.1\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 345\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 47204.01\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 342.15\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.09\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 65.51\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 49.14 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 96.06 \cdot psi \cdot msec$ |
| Load Duration | $td = 3.91\,msec$ |
| Total Load | $F1 = 42810.77\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.04$ | $\frac{Ru}{F1} = 7.99 \times 10^{-3}$ |
| Equivalent Mass | $Me = 11\,\frac{lb\,sec^2}{ft}$ | |

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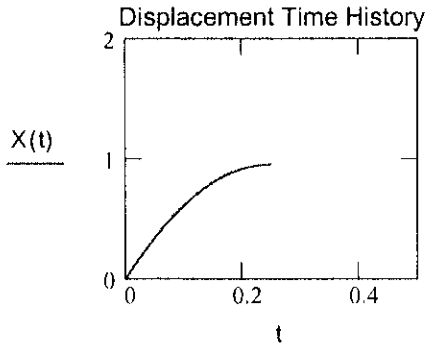


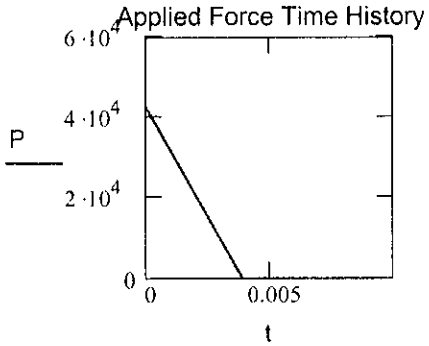


| | | |
|---|---|---|
| Maximum Displacement | $Xm = 11.4\,in$ | |
| Displacement Ductility | $\mu = 131.02$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 8.92\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 171.07\,lb$ | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK |

Building 357
Exterior Concrete Wall
Quad side: Bump Out - 1st Floor **OK**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 2.208 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 14.34 \cdot psi \cdot msec$ |
| Load Duration | $td = 12.989\,msec$ |
| Total Load | $F1 = 7694.44\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.18$ | $\frac{Ru}{F1} = 0.29$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |

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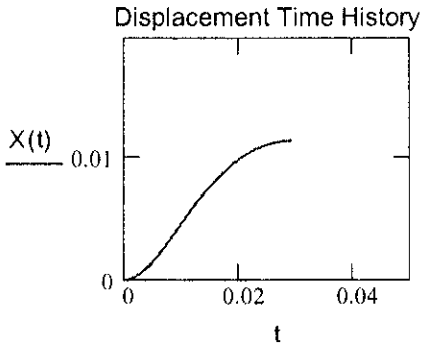
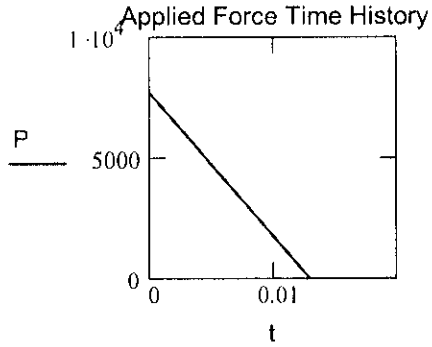



| | | |
|---|---|---|
| Maximum Displacement | Xm = 0.14 in | |
| Displacement Ductility | $\mu = 2.36$ | <15 => OK (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 0.11$ deg | <2 deg => OK (per TM5-853 Vol.2) |
| Applied shear | Va = $1.11 \times 10^3$ lb | |
| Shear capacity | Vc = $6.87 \times 10^4$ lb | > Va => OK |

HE

Date 1/23/2003

San Francisco, California 94103

Building 358
Exterior Concrete Wall
Short Side - 1st Floor **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

HE

Date 1/23/2003

San Francisco, California 94103

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

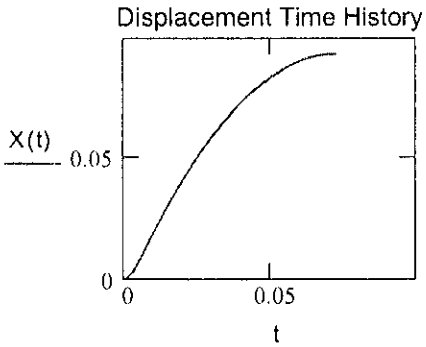
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

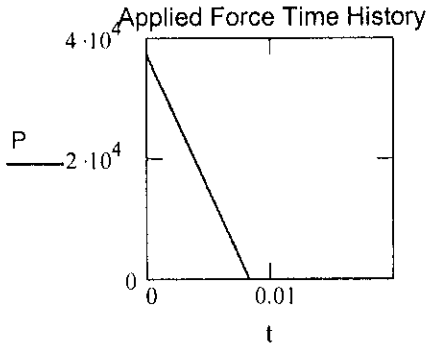
LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 10.68 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 44.40 \cdot psi \cdot msec$ |
| Load Duration | $td = 8.315\,msec$ |
| Total Load | $F1 = 37217.66\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.12$ | $\frac{Ru}{F1} = 0.06$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 1.12\,in$ | | |
| Displacement Ductility | $\mu = 19.18$ | >15 =>NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 0.89\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Shear from Ru | $Va = 1.11 \times 10^3\,lb$ | | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK | |

HE

Date 1/23/2003

San Francisco, California 94103

Building 358
Exterior Concrete Wall
3rd floor - Short Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03 in^2$ |
| Centroid Depth | $yt = 3 in$ |
| Effective Depths | $d = 3 in$ |
| Gross Mom. of Inertia | $Ig = 108 in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51 in$ |
| Cracked Mom. of Inertia | $Ic = 2.03 in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02 in^4$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 453.75\,lb$ | |
| Total Mass | $M = 14.1\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 345\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 47204.01\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 342.15\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.09\,in$ | |

PERIOD OF VIBRATION

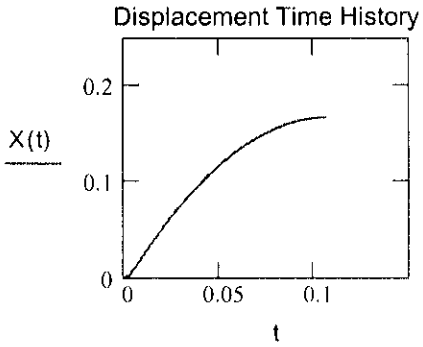
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 65.51\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

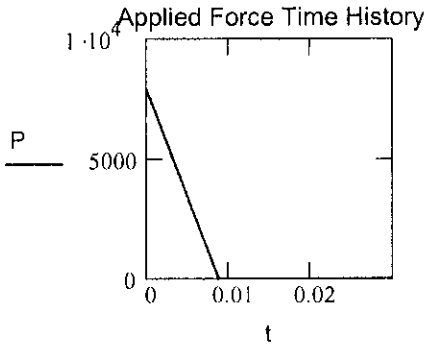
LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 9.10 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 40.21 \cdot psi \cdot msec$ |
| Load Duration | $td = 8.837\,msec$ |
| Total Load | $F1 = 7927.92\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.09$ | $\frac{Ru}{F1} = 0.04$ |
| Equivalent Mass | $Me = 11\,\frac{lb\,sec^2}{ft}$ | |




| | | | |
|---|---|---|---|
| Maximum Displacement | $Xm = 2.01\,in$ | | |
| Displacement Ductility | $\mu = 23.06$ | >15 => NG | (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 1.58\,deg$ | <2 deg => OK | (per TM5-853 Vol.2) |
| Applied Shear | $Va = 171.07\,lb$ | | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK | |

HE

San Francisco, California 94103

Building 358
Exterior Concrete Wall
1st floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Number of Legs | $nv := 1$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

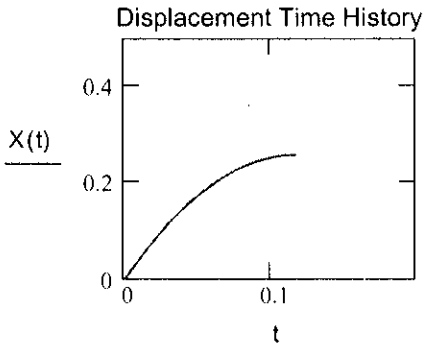
LOAD TIME HISTORY

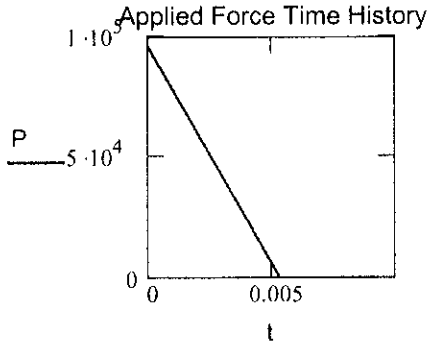
| | |
|---|---|
| Peak Reflective Pressure | $Pr := 27.61 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 73.86 \cdot psi \cdot msec$ |
| Load Duration | $td = 5.35\,msec$ |
| Total Load | $F1 = 96215.33\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.08$ | $\frac{Ru}{F1} = 0.02$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |

San Francisco, California 94103




| | | |
|---|---|---|
| Maximum Displacement | $Xm = 3.1\,in$ | |
| Displacement Ductility | $\mu = 53.01$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 2.45\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

San Francisco, California 94103

Building 358
Exterior Concrete Wall
2nd floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.375 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 1.25 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 24 \cdot in$ | Number of Legs | $nv := 1$ |
| | | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.11 in^2$ |
| Centroid Depth | $yt = 1.44 in$ |
| Effective Depths | $d = 6.56 in$ |
| | $de = 5.13 in$ |
| Gross Mom. of Inertia | $Ig = 1024 in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.78 in$ |
| Cracked Mom. of Inertia | $Ic = 40.86 in^4$ |
| Avg. Mom. of Inertia | $Ia = 532.43 in^4$ |

San Francisco, California 94103

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 2420\,lb$ | |
| Total Mass | $M = 75.22\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 2245.29\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 456826.59\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 2226.73\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.06\,in$ | |

PERIOD OF VIBRATION

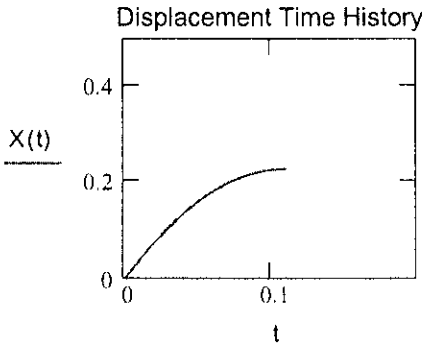
| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 88.24\,Hz$ | |
| Circular Frequency | $T = 0.07\,sec$ | |

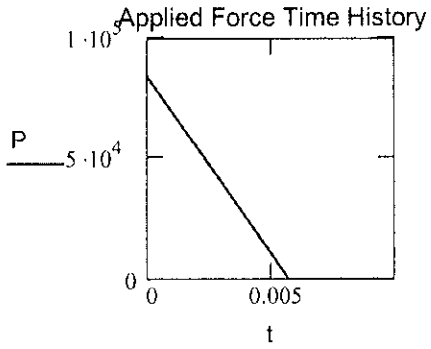
LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 24.16 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 69.23 \cdot psi \cdot msec$ |
| Load Duration | $td = 5.731\,msec$ |
| Total Load | $F1 = 84192.77\,lb$ |

RESPONSE

| | | |
|---|---|---|
| Response Ratios | $\frac{td}{T} = 0.08$ | $\frac{Ru}{F1} = 0.03$ |
| Equivalent Mass | $Me = 58.67\,\frac{lb\,sec^2}{ft}$ | |




| | | |
|---|---|---|
| Maximum Displacement | $Xm = 2.72\,in$ | |
| Displacement Ductility | $\mu = 46.56$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 2.15\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 1.11 \times 10^3\,lb$ | |
| Shear capacity | $Vc = 6.87 \times 10^4\,lb$ | > Va => OK |

San Francisco, California 94103

Building 358
Exterior Concrete Wall
3rd floor - Street Side **NG**

$psi := lb \cdot in^{-2}$

$msec := \frac{sec}{1000}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Bar Diameter | $db := 0.192 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Cover Depth | $c := 2.9 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Bar Spacing | $b := 6 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 2.85 \times 10^{6} lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 47600 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2925 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.03 in^2$ |
| Centroid Depth | $yt = 3 in$ |
| Effective Depths | $d = 3 in$ |
| Gross Mom. of Inertia | $Ig = 108 in^4$ |
| Steel Percentage | $\rho = 0.002$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 0.51 in$ |
| Cracked Mom. of Inertia | $Ic = 2.03 in^4$ |
| Avg. Mom. of Inertia | $Ia = 55.02 in^4$ |

San Francisco, California 94103

MODEL PROPERTIES

| | | |
|---|---|---|
| Wall Weight | $Wt = 453.75\,lb$ | |
| Total Mass | $M = 14.1\,\frac{lb\,sec^2}{ft}$ | |
| Ultimate Moment | $Mu = 345\,lb\,ft$ | |
| Elastic Stiffness | $Ke = 47204.01\,\frac{lb}{ft}$ | (simple and fixed ends) |
| Ultimate Resistance | $Ru = 342.15\,lb$ | (elastic plastic) |
| Elastic Limit Displacement | $Xe = 0.09\,in$ | |

PERIOD OF VIBRATION

| | | |
|---|---|---|
| Load Mass Factor | $Klm := .78$ | (TM5-1300, Table 3-12) |
| Period of Vibration | $\omega = 65.51\,Hz$ | |
| Circular Frequency | $T = 0.1\,sec$ | |

LOAD TIME HISTORY

| | |
|---|---|
| Peak Reflective Pressure | $Pr := 17.57 \cdot psi$ |
| Peak Reflective Impulse | $Ir := 58.83 \cdot psi \cdot msec$ |
| Load Duration | $td = 6.697\,msec$ |
| Total Load | $F1 = 15306.98\,lb$ |

RESPONSE

Response Ratios $\frac{td}{T} = 0.07$ $\frac{Ru}{F1} = 0.02$

Equivalent Mass $Me = 11\,\frac{lb\,sec^2}{ft}$

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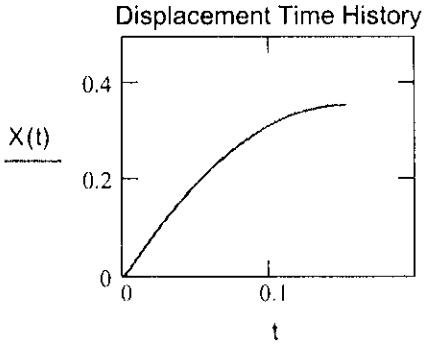


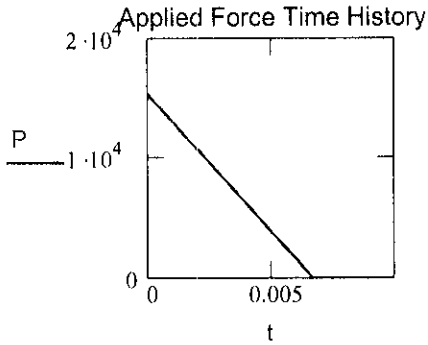


| | | |
|---|---|---|
| Maximum Displacement | $Xm = 4.28\,in$ | |
| Displacement Ductility | $\mu = 49.15$ | >15 => NG (per FBO Criteria 3/00) |
| Peak Support Rotation | $\theta = 3.37\,deg$ | >2 deg => NG (per TM5-853 Vol.2) |
| Applied shear | $Va = 171.07\,lb$ | |
| Shear capacity | $Vc = 7.86 \times 10^3\,lb$ | > Va => OK |

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =     355 Quad side - 1st floor
Run Date             =  1/23/2003
Run Time             = 11:28: 8

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =      120.00 in
  Width                       =       60.00 in
  Height above floor          =        0.00 in
  Height to center of window  =       60.00 in
  Percent Critical Damping    =        2.00
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     7200.00 sq in
  Pane Weight                 =      141.91 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     ANNEALED      LAMINATED          0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1    10000000.      0.220      0.090      4000.0     750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.03      50000.      0.500      3500.      1.370

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        86.9 FT

 INCIDENT PRESSURE
  Peak pressure               =        2.46 PSI
  Peak impulse                =       14.45 PSI-MSEC
  Load duration               =       13.55 MSEC
  Time of arrival             =       55.73 MSEC
  Pseudo linear duration      =       11.73 MSEC

 REFLECTED PRESSURE
  Angle of incidence          =       90.00 DEG
  Pr at angle alpha           =        2.46 PSI
  Impulse at angle alpha      =       14.45 PSI-MSEC
  Load duration               =       13.55 MSEC
  Shock velocity              =        1.19 FT/MSEC
  Time of arrival             =       55.73 MSEC
  Pseudo linear duration      =       11.73 MSEC


 NEGATIVE PRESSURE
  Incident neg pressure       =        0.74 PSI
  Total neg impulse       =       15.06 PSI-MSEC

  Reflected neg pressure      =        1.42 PSI
  Total neg impulse           =       29.03 PSI-MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************
```

```
CALCULATED PARAMETERS

 Ultimate resistance        =        0.53 psi
 Ultimate deflection        =        2.19 in
 Required bite              =       0.924 in
 Specified bite             =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass             =       38.26 psi/in-msec^2
 Stiffness                  =       0.167 psi/in
 Natural period             =       95.17 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Glazing  react long  dir:  POS =     13.29 lb/in
                        REBOUND =    -12.44 lb/in
 Glazing  react short dir:  POS =     11.81 lb/in
                        REBOUND =    -13.11 lb/in

PEAK EDGE SHEAR REACTION LOADS - DYNAMIC CAPACITY
 Glazing  react long  dir:  POS =      8.87 lb/in
                        REBOUND =     -9.52 lb/in
 Glazing  react short dir:  POS =      5.71 lb/in
                        REBOUND =     -6.12 lb/in

EQUIVALENT STATIC REACTION LOADS - GLAZING ONLY
 Long  side   =      19.64 * SIN( 0.0262 * X) +   0.525 * W  lb/in
 Short side   =      19.36 * SIN( 0.0524 * Y) +   0.525 * W  lb/in
 Corner uplift =    -174.01 lb


RESULTS

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT       =            6.95  in
TIME AT MAX DISPLACEMENT        =          146.60 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY

            STATIC        STATIC
 PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
   NO        (psi)          (  in)
    1         0.528          2.190         3.17  FAILED

****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
****************************************************

 ****** DEVIATIONS FROM DEFAULT PARAMETERS ******

  Pane Plate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Glazing Properties *****

  Laminate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Laminate Properties *****

  ***** No Deviations in General Properties *****
```

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =    355 Street side - 1st floor
Run Date            =  2/19/2003
Run Time            = 14:47:14

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       54.00 in
  Width                       =       60.00 in
  Height above floor          =       66.00 in
  Height to center of window  =       93.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.47 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =      136.76 lb    (   6.078  psf   )

  Plate  layers   glass type     layup        thickness (in)
    1      2     FULLY TTG      LAMINATED         0.469

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)        ratio      (pci)       (psi)    Prob.
    1   10000000.       0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.235     0.235

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.      1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =       63.86 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
    1      1     FULLY TTG      MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)        ratio      (pci)       (psi)    Prob.
    1   10000000.       0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =       [redacted] LB  Input
  Equivalent weight (TNT)     =       [redacted] LB
  Range                       =        25.4 FT

 INCIDENT PRESSURE
  Peak pressure               =       21.90 PSI
  Peak impulse                =       43.90 PSI-MSEC
  Load duration               =        7.21 MSEC
  Time of arrival             =        8.30 MSEC
  Pseudo linear duration      =        4.01 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       67.14 PSI
 Impulse at angle alpha      =      109.97 PSI-MSEC
 Load duration               =        7.21 MSEC
 Shock velocity              =        1.69 FT/MSEC
 Time of arrival             =        8.30 MSEC
 Pseudo linear duration      =        3.28 MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        3.04 psi
 Ultimate deflection         =        1.84 in
 Effective mass              =       35.71 psi/in-msec^2
 Stiffness                   =       1.099 psi/in
 Natural period              =       35.82 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        8.37 psi
 Ultimate deflection         =        1.77 in
 Required bite               =       0.843 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.14 in      based on specified bite
 Effective mass              =       76.47 psi/in-msec^2
 Stiffness                   =       3.418 psi/in
 Natural period              =       29.72 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    442.28 lb/in
                         REBOUND =     0.00 lb/in
 Total  react short dir  :  POS =    368.58 lb/in
                         REBOUND =     0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =     234.09 * SIN( 0.0524 * X) +   8.367 * W  lb/in
 Short side   =     233.99 * SIN( 0.0582 * Y) +   8.367 * W  lb/in
 Corner uplift =   -1718.73 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      85.14 * SIN( 0.0524 * X) +   8.367 * W  lb/in
 Short side   =      85.10 * SIN( 0.0582 * Y) +   8.367 * W  lb/in
 Corner uplift =    -625.10 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME          =            4.75 msec
DISPL. OF GLAZING AT BREAK     =            2.34  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         3.047          1.836         1.27  FAILED


RESULTS - Inner Pane of IGU

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT      =            6.99  in
TIME AT MAX DISPLACEMENT       =           20.70 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY
```

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 8.413 | 1.773 | 3.94 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   476    Time:      0.778 msec.     *
*        The contact model was invoked.             *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                    *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Glazing Properties *****

Inner Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =    355 Street side - 2nd floor
Run Date            =  2/19/2003
Run Time            = 14:54:16

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       78.00 in
  Width                       =       60.00 in
  Height above floor          =       42.00 in
  Height to center of window  =       81.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.47 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =      197.54 lb    (   6.078  psf   )

  Plate  layers   glass type     layup        thickness (in)
    1      2     FULLY TTG      LAMINATED         0.469

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.235     0.235

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.      1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =       92.24 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
    1      1     FULLY TTG      MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =       [redacted] LB  Input
  Equivalent weight (TNT)     =       [redacted] LB
  Range                       =        31.9 FT

 INCIDENT PRESSURE
  Peak pressure               =       13.53 PSI
  Peak impulse                =       35.89 PSI-MSEC
  Load duration               =        8.96 MSEC
  Time of arrival             =       12.40 MSEC
  Pseudo linear duration      =        5.30 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       36.23 PSI
 Impulse at angle alpha      =       84.30 PSI-MSEC
 Load duration               =        8.96 MSEC
 Shock velocity              =        1.50 FT/MSEC
 Time of arrival             =       12.40 MSEC
 Pseudo linear duration      =        4.65 MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        2.09 psi
 Ultimate deflection         =        2.19 in
 Effective mass              =       36.53 psi/in-msec^2
 Stiffness                   =       0.632 psi/in
 Natural period              =       47.78 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        6.13 psi
 Ultimate deflection         =        2.19 in
 Required bite               =       0.962 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass              =       78.23 psi/in-msec^2
 Stiffness                   =       1.993 psi/in
 Natural period              =       39.37 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    266.20 lb/in
                         REBOUND =     -0.03 lb/in
 Total  react short dir  :  POS =    246.19 lb/in
                         REBOUND =     -0.03 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =     203.60 * SIN( 0.0403 * X) +   6.125 * W  lb/in
 Short side   =     202.50 * SIN( 0.0524 * Y) +   6.125 * W  lb/in
 Corner uplift =   -1742.02 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      69.44 * SIN( 0.0403 * X) +   6.125 * W  lb/in
 Short side   =      69.07 * SIN( 0.0524 * Y) +   6.125 * W  lb/in
 Corner uplift =    -594.16 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME            =            7.01 msec
DISPL. OF GLAZING AT BREAK       =            2.69  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         2.092          2.190         1.23  FAILED


RESULTS - Inner Pane of IGU

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT        =            7.04  in
TIME AT MAX DISPLACEMENT         =           28.13 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY
```

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 6.159 | 2.192 | 3.21 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first  *
*        detected at the following step and time:   *
*        Step:   471    Time:      1.094 msec.      *
*        The contact model was invoked.              *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to   *
*        a zero time of arrival.                     *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties
Pane Plt  Glazing  Property Name  Input  Default
Outer Pane Plate Properties
Pane Plt  Glazing  Property Name  Input  Default
***** No Deviations in Glazing Properties *****

Inner Laminate Properties
Pane Plt  Glazing  Property Name  Input  Default
Outer Laminate Properties
Pane Plt  Glazing  Property Name  Input  Default
***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =     356 Quad side - 1st floor
Run Date             =  1/23/2003
Run Time             = 11:32:31

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =      120.00 in
  Width                       =       60.00 in
  Height above floor          =        0.00 in
  Height to center of window  =       60.00 in
  Percent Critical Damping    =        2.00
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     7200.00 sq in
  Pane Weight                 =      141.91 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     ANNEALED      LAMINATED          0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio       (pci)      (psi)     Prob.
    1    10000000.     0.220       0.090      4000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.03      50000.      0.500      3500.     1.370

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =       102.6 FT

 INCIDENT PRESSURE
  Peak pressure               =        1.96 PSI
  Peak impulse                =       12.31 PSI-MSEC
  Load duration               =       14.30 MSEC
  Time of arrival             =       68.87 MSEC
  Pseudo linear duration      =       12.58 MSEC

 REFLECTED PRESSURE
  Angle of incidence          =       90.00 DEG
  Pr at angle alpha           =        1.96 PSI
  Impulse at angle alpha      =       12.31 PSI-MSEC
  Load duration               =       14.30 MSEC
  Shock velocity              =        1.18 FT/MSEC
  Time of arrival             =       68.87 MSEC
  Pseudo linear duration      =       12.58 MSEC


 NEGATIVE PRESSURE
  Incident neg pressure       =        0.63 PSI
  Total neg impulse       =       12.80 PSI-MSEC

  Reflected neg pressure      =        1.25 PSI
  Total neg impulse           =       25.29 PSI-MSEC

*****************************************************
*  Note: Output plots are adjusted to a zero        *
*        time of arrival.                           *
*****************************************************
```

```
CALCULATED PARAMETERS

 Ultimate resistance        =        0.53 psi
 Ultimate deflection        =        2.19 in
 Required bite              =       0.924 in
 Specified bite             =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass             =       38.26 psi/in-msec^2
 Stiffness                  =       0.167 psi/in
 Natural period             =       95.17 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Glazing  react long  dir:  POS =     10.56 lb/in
                        REBOUND =     -8.29 lb/in
 Glazing  react short dir:  POS =      9.39 lb/in
                        REBOUND =     -8.63 lb/in

PEAK EDGE SHEAR REACTION LOADS - DYNAMIC CAPACITY
 Glazing  react long  dir:  POS =      8.87 lb/in
                        REBOUND =    -10.78 lb/in
 Glazing  react short dir:  POS =      5.71 lb/in
                        REBOUND =     -6.93 lb/in

EQUIVALENT STATIC REACTION LOADS - GLAZING ONLY
 Long  side   =      19.64 * SIN( 0.0262 * X) +   0.525 * W  lb/in
 Short side   =      19.36 * SIN( 0.0524 * Y) +   0.525 * W  lb/in
 Corner uplift =    -174.01 lb


RESULTS

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT       =            5.33  in
TIME AT MAX DISPLACEMENT        =          157.19 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         0.528          2.190         2.43  FAILED

****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
****************************************************

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

 Pane Plate Properties
 Pane Plt   Glazing    Property Name         Input     Default
 ***** No Deviations in Glazing Properties *****

 Laminate Properties
 Pane Plt   Glazing    Property Name         Input     Default
 ***** No Deviations in Laminate Properties *****

 ***** No Deviations in General Properties *****
```

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =    356 Street side - 1st floor
Run Date            =  2/19/2003
Run Time            = 14:56:48

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       54.00 in
  Width                       =       60.00 in
  Height above floor          =       66.00 in
  Height to center of window  =       93.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.84 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =      246.11 lb    (  10.938  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED         0.844

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.422     0.422

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No       (inch)      (psi)      ratio      (psi)
    1        0.06      50000.      0.500      3500.     1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =       63.86 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =       [redacted] LB  Input
  Equivalent weight (TNT)     =       [redacted] LB
  Range                       =        13.4 FT

 INCIDENT PRESSURE
  Peak pressure               =       93.90 PSI
  Peak impulse                =       80.07 PSI-MSEC
  Load duration               =        6.44 MSEC
  Time of arrival             =        2.53 MSEC
  Pseudo linear duration      =        1.71 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =      459.00 PSI
 Impulse at angle alpha      =      241.47 PSI-MSEC
 Load duration               =        6.44 MSEC
 Shock velocity              =        2.83 FT/MSEC
 Time of arrival             =        2.53 MSEC
 Pseudo linear duration      =        1.05 MSEC

*****************************************************
*  Note: Output plots are adjusted to a zero        *
*        time of arrival.                           *
*****************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        3.04 psi
 Ultimate deflection         =        1.84 in
 Effective mass              =       35.71 psi/in-msec^2
 Stiffness                   =       1.099 psi/in
 Natural period              =       35.82 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =       20.19 psi
 Ultimate deflection         =        1.43 in
 Required bite               =       0.843 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.14 in     based on specified bite
 Effective mass              =      137.61 psi/in-msec^2
 Stiffness                   =      11.802 psi/in
 Natural period              =       21.46 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =   2855.38 lb/in
                         REBOUND =      0.00 lb/in
 Total  react short dir  :  POS =   2379.49 lb/in
                         REBOUND =      0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =     564.75 * SIN( 0.0524 * X) +  20.186 * W  lb/in
 Short side   =     564.51 * SIN( 0.0582 * Y) +  20.186 * W  lb/in
 Corner uplift =   -4146.44 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      85.14 * SIN( 0.0524 * X) +  20.186 * W  lb/in
 Short side   =      85.10 * SIN( 0.0582 * Y) +  20.186 * W  lb/in
 Corner uplift =    -625.10 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME          =            3.25 msec
DISPL. OF GLAZING AT BREAK     =            2.34  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         3.047          1.836         1.27  FAILED


RESULTS - Inner Pane of IGU

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT      =            6.96  in
TIME AT MAX DISPLACEMENT       =           13.15 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY
```

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 20.216 | 1.430 | 4.87 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   560    Time:      0.294 msec.     *
*        The contact model was invoked.            *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Glazing Properties *****

Inner Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =    356 Street side - 2nd floor
Run Date            =  2/19/2003
Run Time            = 15: 2:55

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       78.00 in
  Width                       =       60.00 in
  Height above floor          =       42.00 in
  Height to center of window  =       81.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.84 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =      355.49 lb    (  10.938  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED          0.844

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio       (pci)      (psi)     Prob.
    1   10000000.      0.220       0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.422     0.422

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.      1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =       92.24 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC         0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio       (pci)      (psi)     Prob.
    1   10000000.      0.220       0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        23.5 FT

 INCIDENT PRESSURE
  Peak pressure               =       25.98 PSI
  Peak impulse                =       47.11 PSI-MSEC
  Load duration               =        6.61 MSEC
  Time of arrival             =        7.21 MSEC
  Pseudo linear duration      =        3.63 MSEC

 REFLECTED PRESSURE
```

```
  Angle of incidence          =        0.00 DEG
  Pr at angle alpha           =       83.39 PSI
  Impulse at angle alpha      =      120.60 PSI-MSEC
  Load duration               =        6.61 MSEC
  Shock velocity              =        1.77 FT/MSEC
  Time of arrival             =        7.21 MSEC
  Pseudo linear duration      =        2.89 MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************

 CALCULATED PARAMETERS - Outer Pane of IGU

  Ultimate resistance         =        2.09 psi
  Ultimate deflection         =        2.19 in
  Effective mass              =       36.53 psi/in-msec^2
  Stiffness                   =       0.632 psi/in
  Natural period              =       47.78 msec

 CALCULATED PARAMETERS - Inner Pane of IGU

  Ultimate resistance         =       16.50 psi
  Ultimate deflection         =        1.95 in
  Required bite               =       0.962 in
  Specified bite              =        0.63 in
  Max. displ. limited to    7.52 in     based on specified bite
  Effective mass              =      140.78 psi/in-msec^2
  Stiffness                   =       6.833 psi/in
  Natural period              =       28.52 msec

 PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
  Total  react long  dir  :  POS =    606.24 lb/in
                         REBOUND =      0.00 lb/in
  Total  react short dir  :  POS =    560.74 lb/in
                         REBOUND =      0.00 lb/in

 EQUIVALENT STATIC REACTION LOADS - INNER PANE
  Long  side   =     548.55 * SIN( 0.0403 * X) +  16.503 * W  lb/in
  Short side   =     545.58 * SIN( 0.0524 * Y) +  16.503 * W  lb/in
  Corner uplift =   -4693.39 lb

 EQUIVALENT STATIC REACTION LOADS - OUTER PANE
  Long  side   =      69.44 * SIN( 0.0403 * X) +  16.503 * W  lb/in
  Short side   =      69.07 * SIN( 0.0524 * Y) +  16.503 * W  lb/in
  Corner uplift =    -594.16 lb


 RESULTS - Outer Pane of IGU

 *****************GLAZING FAILS*******************
 GLAZING FAILS AT TIME            =          10.88 msec
 DISPL. OF GLAZING AT BREAK       =           2.69  in

             STATIC        STATIC
 PLATE     RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
   NO        (psi)          (  in)
    1         2.092          2.190         1.23   FAILED



 RESULTS - Inner Pane of IGU

 *********GLAZING CRACKS/REMAINS IN FRAME*********
 MAXIMUM PANE DISPLACEMENT        =           2.73  in
 TIME AT MAX DISPLACEMENT         =          29.70 msec

 GSA PERFORMANCE CONDITION 2

 UK HAZARD RATING          BREAKS SAFELY
```

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 16.573 | 1.946 | 1.41 | FAILED |

```
****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   486    Time:      0.701 msec.     *
*        The contact model was invoked.            *
****************************************************
****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Glazing Properties *****

Inner Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =     357 Quad side - 1st floor
Run Date             =  1/23/2003
Run Time             = 11:33:38

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =      120.00 in
  Width                       =       60.00 in
  Height above floor          =        0.00 in
  Height to center of window  =       60.00 in
  Percent Critical Damping    =        2.00
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     7200.00 sq in
  Pane Weight                 =      141.91 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     ANNEALED      LAMINATED         0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090      4000.0     750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.03      50000.      0.500      3500.      1.370

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        89.3 FT

 INCIDENT PRESSURE
  Peak pressure               =        2.37 PSI
  Peak impulse                =       14.07 PSI-MSEC
  Load duration               =       13.67 MSEC
  Time of arrival             =       57.73 MSEC
  Pseudo linear duration      =       11.87 MSEC

 REFLECTED PRESSURE
  Angle of incidence          =       90.00 DEG
  Pr at angle alpha           =        2.37 PSI
  Impulse at angle alpha      =       14.07 PSI-MSEC
  Load duration               =       13.67 MSEC
  Shock velocity              =        1.19 FT/MSEC
  Time of arrival             =       57.73 MSEC
  Pseudo linear duration      =       11.87 MSEC


 NEGATIVE PRESSURE
  Incident neg pressure       =        0.72 PSI
  Total neg impulse       =       14.65 PSI-MSEC

  Reflected neg pressure      =        1.39 PSI
  Total neg impulse           =       28.38 PSI-MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************
```

```
CALCULATED PARAMETERS

 Ultimate resistance        =        0.53 psi
 Ultimate deflection        =        2.19 in
 Required bite              =       0.924 in
 Specified bite             =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass             =       38.26 psi/in-msec^2
 Stiffness                  =       0.167 psi/in
 Natural period             =       95.17 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Glazing  react long  dir:  POS =      12.79 lb/in
                       REBOUND =     -11.66 lb/in
 Glazing  react short dir:  POS =      11.37 lb/in
                       REBOUND =     -12.26 lb/in

PEAK EDGE SHEAR REACTION LOADS - DYNAMIC CAPACITY
 Glazing  react long  dir:  POS =       8.87 lb/in
                       REBOUND =      -9.63 lb/in
 Glazing  react short dir:  POS =       5.71 lb/in
                       REBOUND =      -6.19 lb/in

EQUIVALENT STATIC REACTION LOADS - GLAZING ONLY
 Long  side   =      19.64 * SIN( 0.0262 * X) +   0.525 * W  lb/in
 Short side   =      19.36 * SIN( 0.0524 * Y) +   0.525 * W  lb/in
 Corner uplift =    -174.01 lb


RESULTS

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT       =            6.72  in
TIME AT MAX DISPLACEMENT        =          148.41 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         0.528          2.190         3.07  FAILED

***************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
***************************************************

 ****** DEVIATIONS FROM DEFAULT PARAMETERS ******

  Pane Plate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Glazing Properties *****

  Laminate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Laminate Properties *****

  ***** No Deviations in General Properties *****
```

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =    357 Street side - 1st floor
Run Date             =  2/19/2003
Run Time             = 15: 7:15

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       54.00 in
  Width                       =       60.00 in
  Height above floor          =       66.00 in
  Height to center of window  =       93.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.47 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =      136.76 lb    (   6.078  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED         0.469

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.235     0.235

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.     1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =       63.86 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)     Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
      0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        23.2 FT

 INCIDENT PRESSURE
  Peak pressure               =       26.74 PSI
  Peak impulse                =       47.67 PSI-MSEC
  Load duration               =        6.53 MSEC
  Time of arrival             =        7.04 MSEC
  Pseudo linear duration      =        3.57 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       86.51 PSI
 Impulse at angle alpha      =      122.47 PSI-MSEC
 Load duration               =        6.53 MSEC
 Shock velocity              =        1.79 FT/MSEC
 Time of arrival             =        7.04 MSEC
 Pseudo linear duration      =        2.83 MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        3.04 psi
 Ultimate deflection         =        1.84 in
 Effective mass              =       35.71 psi/in-msec^2
 Stiffness                   =       1.099 psi/in
 Natural period              =       35.82 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        8.37 psi
 Ultimate deflection         =        1.77 in
 Required bite               =       0.843 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.14 in     based on specified bite
 Effective mass              =       76.47 psi/in-msec^2
 Stiffness                   =       3.418 psi/in
 Natural period              =       29.72 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    567.11 lb/in
                         REBOUND =     0.00 lb/in
 Total  react short dir  :  POS =    472.60 lb/in
                         REBOUND =     0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =     234.09 * SIN( 0.0524 * X) +   8.367 * W  lb/in
 Short side   =     233.99 * SIN( 0.0582 * Y) +   8.367 * W  lb/in
 Corner uplift =   -1718.73 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      85.14 * SIN( 0.0524 * X) +   8.367 * W  lb/in
 Short side   =      85.10 * SIN( 0.0582 * Y) +   8.367 * W  lb/in
 Corner uplift =    -625.10 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME           =            4.27 msec
DISPL. OF GLAZING AT BREAK      =            2.34  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         3.047          1.836         1.27  FAILED


RESULTS - Inner Pane of IGU

**************GLAZING BITE FAILURE***************
GLAZING PULLS OUT AT TIME       =           16.37 msec
DISPL. OF GLAZING AT PULLOUT    =            7.14  in
GLAZING/LAMINATE LANDS AT T     =          710.27 msec
MAXIMUM GLAZING/LAM. VELOCITY   =          629.70  in/sec
FRAGMENT FINAL X-DISPLACEMENT   =          119.98  in
FRAGMENT FINAL Y-DISPLACEMENT   =           -0.01  in
```

GSA PERFORMANCE CONDITION 3B

UK HAZARD RATING LOW HAZARD

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 8.413 | 1.773 | 4.03 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   483    Time:      0.682 msec.     *
*        The contact model was invoked.            *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Pane Plate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Glazing Properties *****

Inner Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

Outer Laminate Properties

| Pane Plt | Glazing | Property Name | Input | Default |
|---|---|---|---|---|

***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =    357 Street side - 2nd floor
Run Date             =  2/19/2003
Run Time             = 15:15:42

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       78.00 in
  Width                       =       60.00 in
  Height above floor          =       42.00 in
  Height to center of window  =       81.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.47 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =      197.54 lb    (   6.078  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED         0.469

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)    Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.235     0.235

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.      1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =       92.24 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)    Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        30.2 FT

 INCIDENT PRESSURE
  Peak pressure               =       15.15 PSI
  Peak impulse                =       37.65 PSI-MSEC
  Load duration               =        8.60 MSEC
  Time of arrival             =       11.28 MSEC
  Pseudo linear duration      =        4.97 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       41.76 PSI
 Impulse at angle alpha      =       89.80 PSI-MSEC
 Load duration               =        8.60 MSEC
 Shock velocity              =        1.53 FT/MSEC
 Time of arrival             =       11.28 MSEC
 Pseudo linear duration      =        4.30 MSEC

****************************************************
*  Note: Output plots are adjusted to a zero       *
*        time of arrival.                          *
****************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        2.09 psi
 Ultimate deflection         =        2.19 in
 Effective mass              =       36.53 psi/in-msec^2
 Stiffness                   =       0.632 psi/in
 Natural period              =       47.78 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        6.13 psi
 Ultimate deflection         =        2.19 in
 Required bite               =       0.962 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass              =       78.23 psi/in-msec^2
 Stiffness                   =       1.993 psi/in
 Natural period              =       39.37 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    306.60 lb/in
                         REBOUND =     0.00 lb/in
 Total  react short dir  :  POS =    283.57 lb/in
                         REBOUND =     0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =     203.60 * SIN( 0.0403 * X) +   6.125 * W  lb/in
 Short side   =     202.50 * SIN( 0.0524 * Y) +   6.125 * W  lb/in
 Corner uplift =   -1742.02 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      69.44 * SIN( 0.0403 * X) +   6.125 * W  lb/in
 Short side   =      69.07 * SIN( 0.0524 * Y) +   6.125 * W  lb/in
 Corner uplift =    -594.16 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME          =            6.60 msec
DISPL. OF GLAZING AT BREAK     =            2.69  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         2.092          2.190         1.23  FAILED



RESULTS - Inner Pane of IGU

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT      =            7.35  in
TIME AT MAX DISPLACEMENT       =           27.12 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING         BREAKS SAFELY
```

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 6.159 | 2.192 | 3.35 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   472    Time:      1.013 msec.     *
*        The contact model was invoked.             *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                    *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties
Pane Plt  Glazing  Property Name  Input  Default
Outer Pane Plate Properties
Pane Plt  Glazing  Property Name  Input  Default
***** No Deviations in Glazing Properties *****

Inner Laminate Properties
Pane Plt  Glazing  Property Name  Input  Default
Outer Laminate Properties
Pane Plt  Glazing  Property Name  Input  Default
***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =     358 Quad side - 1st floor
Run Date            =  1/23/2003
Run Time            = 11:34:14

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =      120.00 in
  Width                       =       60.00 in
  Height above floor          =        0.00 in
  Height to center of window  =       60.00 in
  Percent Critical Damping    =        2.00
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     7200.00 sq in
  Pane Weight                 =      141.91 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     ANNEALED      LAMINATED          0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)        ratio      (pci)       (psi)    Prob.
    1    10000000.       0.220      0.090      4000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.03      50000.      0.500      3500.     1.370

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        99.3 FT

 INCIDENT PRESSURE
  Peak pressure               =        2.05 PSI
  Peak impulse                =       12.70 PSI-MSEC
  Load duration               =       14.15 MSEC
  Time of arrival             =       66.10 MSEC
  Pseudo linear duration      =       12.42 MSEC

 REFLECTED PRESSURE
  Angle of incidence          =       90.00 DEG
  Pr at angle alpha           =        2.05 PSI
  Impulse at angle alpha      =       12.70 PSI-MSEC
  Load duration               =       14.15 MSEC
  Shock velocity              =        1.18 FT/MSEC
  Time of arrival             =       66.10 MSEC
  Pseudo linear duration      =       12.42 MSEC


 NEGATIVE PRESSURE
  Incident neg pressure       =        0.65 PSI
  Total neg impulse       =       13.20 PSI-MSEC

  Reflected neg pressure      =        1.28 PSI
  Total neg impulse           =       25.99 PSI-MSEC

**************************************************
*  Note: Output plots are adjusted to a zero     *
*        time of arrival.                        *
**************************************************
```

```
CALCULATED PARAMETERS

 Ultimate resistance        =        0.53 psi
 Ultimate deflection        =        2.19 in
 Required bite              =       0.924 in
 Specified bite             =        0.63 in
 Max. displ. limited to    7.52 in     based on specified bite
 Effective mass             =       38.26 psi/in-msec^2
 Stiffness                  =       0.167 psi/in
 Natural period             =       95.17 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Glazing  react long  dir:  POS =     11.04 lb/in
                         REBOUND =     -9.00 lb/in
 Glazing  react short dir:  POS =      9.81 lb/in
                         REBOUND =     -9.39 lb/in

PEAK EDGE SHEAR REACTION LOADS - DYNAMIC CAPACITY
 Glazing  react long  dir:  POS =      8.87 lb/in
                         REBOUND =    -10.42 lb/in
 Glazing  react short dir:  POS =      5.71 lb/in
                         REBOUND =     -6.70 lb/in

EQUIVALENT STATIC REACTION LOADS - GLAZING ONLY
 Long  side   =      19.64 * SIN( 0.0262 * X) +   0.525 * W  lb/in
 Short side   =      19.36 * SIN( 0.0524 * Y) +   0.525 * W  lb/in
 Corner uplift =    -174.01 lb


RESULTS

*********GLAZING CRACKS/REMAINS IN FRAME*********
MAXIMUM PANE DISPLACEMENT       =            5.68  in
TIME AT MAX DISPLACEMENT        =          155.19 msec

GSA PERFORMANCE CONDITION 2

UK HAZARD RATING          BREAKS SAFELY

            STATIC        STATIC
 PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
   NO        (psi)          (  in)
    1         0.528          2.190         2.59  FAILED

****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
****************************************************

 ****** DEVIATIONS FROM DEFAULT PARAMETERS ******

  Pane Plate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Glazing Properties *****

  Laminate Properties
  Pane Plt   Glazing    Property Name         Input     Default
  ***** No Deviations in Laminate Properties *****

  ***** No Deviations in General Properties *****
```

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title        =    358 Street side - 1st floor
Run Date             =  2/19/2003
Run Time             = 15:18:51

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       54.00 in
  Width                       =       60.00 in
  Height above floor          =       66.00 in
  Height to center of window  =       93.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =       63.86 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED         0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No      (psi)        ratio      (pci)       (psi)     Prob.
    1   10000000.       0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.     1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     3240.00 sq in
  Pane Weight                 =       63.86 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No      (psi)        ratio      (pci)       (psi)     Prob.
    1   10000000.       0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        35.8 FT

 INCIDENT PRESSURE
  Peak pressure               =       10.75 PSI
  Peak impulse                =       32.46 PSI-MSEC
  Load duration               =        9.64 MSEC
  Time of arrival             =       15.08 MSEC
  Pseudo linear duration      =        6.04 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       27.28 PSI
 Impulse at angle alpha      =       73.86 PSI-MSEC
 Load duration               =        9.64 MSEC
 Shock velocity              =        1.43 FT/MSEC
 Time of arrival             =       15.08 MSEC
 Pseudo linear duration      =        5.42 MSEC

*****************************************************
*  Note: Output plots are adjusted to a zero        *
*        time of arrival.                           *
*****************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        3.04 psi
 Ultimate deflection         =        1.84 in
 Effective mass              =       35.71 psi/in-msec^2
 Stiffness                   =       1.099 psi/in
 Natural period              =       35.82 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        2.28 psi
 Ultimate deflection         =        1.84 in
 Required bite               =       0.843 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.14 in      based on specified bite
 Effective mass              =       35.71 psi/in-msec^2
 Stiffness                   =       0.824 psi/in
 Natural period              =       41.36 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    179.38 lb/in
                         REBOUND =     0.00 lb/in
 Total  react short dir  :  POS =    149.52 lb/in
                         REBOUND =     0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =      63.84 * SIN( 0.0524 * X) +   2.282 * W  lb/in
 Short side   =      63.82 * SIN( 0.0582 * Y) +   2.282 * W  lb/in
 Corner uplift =    -468.74 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      85.14 * SIN( 0.0524 * X) +   2.282 * W  lb/in
 Short side   =      85.10 * SIN( 0.0582 * Y) +   2.282 * W  lb/in
 Corner uplift =    -625.10 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS******************
GLAZING FAILS AT TIME            =            4.84 msec
DISPL. OF GLAZING AT BREAK       =            2.34  in

            STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         3.047          1.836         1.27  FAILED


RESULTS - Inner Pane of IGU

**************GLAZING BITE FAILURE***************
GLAZING PULLS OUT AT TIME        =           15.64 msec
DISPL. OF GLAZING AT PULLOUT     =            7.14  in
GLAZING/LAMINATE LANDS AT T      =          709.54 msec
MAXIMUM GLAZING/LAM. VELOCITY    =          323.25  in/sec
FRAGMENT FINAL X-DISPLACEMENT    =           68.45  in
FRAGMENT FINAL Y-DISPLACEMENT    =           -0.01  in
```

GSA PERFORMANCE CONDITION 3B

UK HAZARD RATING LOW HAZARD

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 2.286 | 1.836 | 3.89 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   483    Time:      1.305 msec.     *
*        The contact model was invoked.             *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                    *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties
Pane Plt Glazing Property Name Input Default
Outer Pane Plate Properties
Pane Plt Glazing Property Name Input Default
***** No Deviations in Glazing Properties *****

Inner Laminate Properties
Pane Plt Glazing Property Name Input Default
Outer Laminate Properties
Pane Plt Glazing Property Name Input Default
***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

```
WINdow Glazing Analysis Response and Design
WINGARD 3.1 - 12 August 2002
Problem Title       =    358 Street side - 2nd floor
Run Date            =  2/19/2003
Run Time            = 15:22:23

 PROBLEM DESCRIPTION

 WINDOW INPUT
  Height                      =       78.00 in
  Width                       =       60.00 in
  Height above floor          =       42.00 in
  Height to center of window  =       81.00 in
  Percent Critical Damping    =        2.00

 INNER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =       92.24 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      2     FULLY TTG     LAMINATED         0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)    Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.109     0.109

 LAMINATE PROPERTIES:
  Plate    Thickness   Modulus     Poisson    strength   elongation
   No        (inch)      (psi)      ratio      (psi)
    1         0.06      50000.      0.500      3500.     1.370

 OUTER PANE PARAMETERS
  Pane Thickness              =        0.22 in    (  1 plates)
  Pane Area                   =     4680.00 sq in
  Pane Weight                 =       92.24 lb    (   2.838  psf   )

  Plate  layers   glass type     layup        thickness (in)
     1      1     FULLY TTG     MONOLITHIC        0.219

 GLAZING PROPERTIES:
  Plate    Modulus     Poisson     density    strength   Fail
   No       (psi)       ratio      (pci)       (psi)    Prob.
    1   10000000.      0.220      0.090     16000.0    750.

  Plate    1 layer thicknesses ( in    )
       0.219

 AIR SPACE                    =       0.50 in

 AIRBLAST INPUT

  Method                      =   Charge Weight and Range

  (EQUIVALENT TRIANGULAR LOAD)

  Equivalence based on        =   PRESSURE
  Explosive type              =   TNT
  Charge weight               =        [redacted] LB  Input
  Equivalent weight (TNT)     =        [redacted] LB
  Range                       =        40.7 FT

 INCIDENT PRESSURE
  Peak pressure               =        8.41 PSI
  Peak impulse                =       29.02 PSI-MSEC
  Load duration               =       10.31 MSEC
  Time of arrival             =       18.62 MSEC
  Pseudo linear duration      =        6.90 MSEC

 REFLECTED PRESSURE
```

```
 Angle of incidence          =        0.00 DEG
 Pr at angle alpha           =       20.23 PSI
 Impulse at angle alpha      =       63.88 PSI-MSEC
 Load duration               =       10.31 MSEC
 Shock velocity              =        1.36 FT/MSEC
 Time of arrival             =       18.62 MSEC
 Pseudo linear duration      =        6.31 MSEC

*****************************************************
*  Note: Output plots are adjusted to a zero        *
*        time of arrival.                           *
*****************************************************

CALCULATED PARAMETERS - Outer Pane of IGU

 Ultimate resistance         =        2.09 psi
 Ultimate deflection         =        2.19 in
 Effective mass              =       36.53 psi/in-msec^2
 Stiffness                   =       0.632 psi/in
 Natural period              =       47.78 msec

CALCULATED PARAMETERS - Inner Pane of IGU

 Ultimate resistance         =        1.56 psi
 Ultimate deflection         =        2.19 in
 Required bite               =       0.962 in
 Specified bite              =        0.63 in
 Max. displ. limited to    7.52 in      based on specified bite
 Effective mass              =       36.53 psi/in-msec^2
 Stiffness                   =       0.474 psi/in
 Natural period              =       55.17 msec

PEAK EDGE SHEAR REACTION LOADS - ACTUAL DYNAMIC
 Total  react long  dir  :  POS =    145.44 lb/in
                         REBOUND =     0.00 lb/in
 Total  react short dir  :  POS =    134.43 lb/in
                         REBOUND =     0.00 lb/in

EQUIVALENT STATIC REACTION LOADS - INNER PANE
 Long  side   =      51.92 * SIN( 0.0403 * X) +   1.562 * W  lb/in
 Short side   =      51.64 * SIN( 0.0524 * Y) +   1.562 * W  lb/in
 Corner uplift =    -444.24 lb

EQUIVALENT STATIC REACTION LOADS - OUTER PANE
 Long  side   =      69.44 * SIN( 0.0403 * X) +   1.562 * W  lb/in
 Short side   =      69.07 * SIN( 0.0524 * Y) +   1.562 * W  lb/in
 Corner uplift =    -594.16 lb


RESULTS - Outer Pane of IGU

*****************GLAZING FAILS*******************
GLAZING FAILS AT TIME           =            5.90 msec
DISPL. OF GLAZING AT BREAK      =            2.69  in

           STATIC        STATIC
PLATE    RESISTANCE   DISPLACEMENT    DUCTILITY  STATUS
  NO        (psi)          (  in)
   1         2.092          2.190         1.23  FAILED


RESULTS - Inner Pane of IGU

**************GLAZING BITE FAILURE***************
GLAZING PULLS OUT AT TIME       =           16.02 msec
DISPL. OF GLAZING AT PULLOUT    =            7.52  in
GLAZING/LAMINATE LANDS AT T     =          663.62 msec
MAXIMUM GLAZING/LAM. VELOCITY   =          486.93  in/sec
FRAGMENT FINAL X-DISPLACEMENT   =          105.63  in
FRAGMENT FINAL Y-DISPLACEMENT   =           -0.01  in
```

GSA PERFORMANCE CONDITION 3B

UK HAZARD RATING LOW HAZARD

| PLATE NO | STATIC RESISTANCE (psi) | STATIC DISPLACEMENT ( in) | DUCTILITY | STATUS |
|---|---|---|---|---|
| 1 | 1.569 | 2.190 | 3.43 | FAILED |

```
*****************************************************
*  Note: Potential contact between panes was first *
*        detected at the following step and time:  *
*        Step:   510    Time:      1.607 msec.     *
*        The contact model was invoked.             *
*****************************************************
*****************************************************
*  Note: Output results for times are relative to  *
*        a zero time of arrival.                   *
*****************************************************
```

****** DEVIATIONS FROM DEFAULT PARAMETERS ******

Inner Pane Plate Properties
Pane Plt Glazing Property Name Input Default
Outer Pane Plate Properties
Pane Plt Glazing Property Name Input Default
***** No Deviations in Glazing Properties *****

Inner Laminate Properties
Pane Plt Glazing Property Name Input Default
Outer Laminate Properties
Pane Plt Glazing Property Name Input Default
***** No Deviations in Laminate Properties *****

***** No Deviations in General Properties *****

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San Francisco, California 94103

Date 1/22/2003

**Schofield Barracks 3A**
**Building 355 - Base Shear Due to Blast**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

Height of Building Above Ground $H := 54.4 \cdot ft$

**25.4 foot Standoff**

Design Ductility $\mu := 5$ (Value of 5 recommended by FBO - Section 13.4.4.2.1)

Coefficient Ct $Ct := 0.02 \cdot \frac{sec}{ft^{.75}}$ (Value recommended for reinforced concrete shear wall buildings by FBO - Section 13.4.4.1.3)

Building Period $T = 0.4\,sec$

Total Impulse $I := 60030 \cdot lb \cdot sec$

(from the United States Department of State Office of Foreign Buildings Operations A & E Design Guidelines for U. S. Diplomatic Mission Buildings -- Section 13.4.4.5)

Base Shear due to Blast $Vb = 235374.3\,lb$



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Date 1/22/2003

**Schofield Barracks 3A**
**Building 356 - Base Shear Due to Blast**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

Height of Building Above Ground $H := 54.4 \cdot ft$

**13.4 foot Standoff**

Design Ductility $\mu := 5$ (Value of 5 recommended by FBO - Section 13.4.4.2.1)

Coefficient Ct $C_t := 0.02 \cdot \frac{sec}{ft^{.75}}$ (Value recommended for reinforced concrete shear wall buildings by FBO - Section 13.4.4.1.3)

Building Period $T = 0.4\,sec$

Total Impulse $I := 60710 \cdot lb \cdot sec$

(from the United States Department of State Office of Foreign Buildings Operations A & E Design Guidelines for U. S. Diplomatic Mission Buildings -- Section 13.4.4.5)

Base Shear due to Blast $Vb = 238040.55\,lb$



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Date 1/22/2003

**Schofield Barracks 3A**
**Building 357 - Base Shear Due to Blast**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

Height of Building Above Ground $H := 54.4 \cdot ft$

**23.2 foot Standoff**

Design Ductility $\mu := 5$ (Value of 5 recommended by FBO - Section 13.4.4.2.1)

Coefficient Ct $C_t := 0.02 \cdot \frac{sec}{ft^{.75}}$ (Value recommended for reinforced concrete shear wall buildings by FBO - Section 13.4.4.1.3)

Building Period $T = 0.4\,sec$

Total Impulse $I := 60360 \cdot lb \cdot sec$

(from the United States Department of State Office of Foreign Buildings Operations A & E Design Guidelines for U. S. Diplomatic Mission Buildings -- Section 13.4.4.5)

Base Shear due to Blast $Vb = 236668.22\,lb$



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Date 1/22/2003

**Schofield Barracks 3A**
**Building 358 - Base Shear Due to Blast**

vc

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

Height of Building Above Ground $H := 54.4 \cdot ft$

**35.8 foot Standoff**

Design Ductility $\mu := 5$ (Value of 5 recommended by FBO - Section 13.4.4.2.1)

Coefficient Ct $C_t := 0.02 \cdot \frac{sec}{ft^{.75}}$ (Value recommended for reinforced concrete shear wall buildings by FBO - Section 13.4.4.1.3)

Building Period $T = 0.4\,sec$

Total Impulse $I := 60360 \cdot lb \cdot sec$

(from the United States Department of State Office of Foreign Buildings Operations A & E Design Guidelines for U. S. Diplomatic Mission Buildings -- Section 13.4.4.5)

Base Shear due to Blast $Vb = 226709.02\,lb$



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Building 356
2nd Floor Closer Beam H downward
Retrofit with steel shear plate bolted to sides of beam
Use Retrofit on 3rd floor H beams also.

VC

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

| | | | |
|---|---|---|---|
| Beam Length | $L := 20 \cdot ft$ | Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Beam Depth (total) | $h := 20 \cdot in$ | Existing Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Beam Width | $b := 14 \cdot in$ | New Steel Plate Yield Strength | $fy_{new} := 36000 \cdot psi$ |
| Cover Depth | $c := 1.25 \cdot in$ | | |
| Slab Thickness | $t := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Slab 1 Length | $B1 := 16.83 \cdot ft$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab 2 Length | $B2 := 16.33 \cdot ft$ | Live Load | $LL := 50 \cdot lb \cdot ft^{-2}$ |
| | | Shear Reinf. Dia. | $dv := 0.25 \cdot in$ |
| Tension Rebar Diameter | $db_1 := 1 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $db_{0.75} := 0.75 \cdot in$ | | $Ec = 2.85 \times 10^6 \, lb \cdot in^{-2}$ |

| | |
|---|---|
| Number of PositiveTension Bars 1" Dia. | $npb_1 := 6$ |
| Number of PositiveTension Bars 3/4" Dia. | $npb_{0.75} := 1$ |
| Number of NegativeTension Bars 1" Dia. | $nnb_1 := 2$ |
| Number of NegativeTension Bars 3/4" Dia. | $nnb_{0.75} := 1$ |

Effective Width $B := \frac{B1 + B2}{2}$ $B = 16.58 \, ft$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.17$ | |
| Concrete DIF | $DIFc := 1.19$ | (TM5-1300, Table 4-1) |
| Dynamic Existing Steel Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 46800 \, lb \cdot in^{-2}$ |
| Dynamic New Steel Yield Strength | $fdy_{new} := DIFs \cdot fy_{new}$ | $fdy_{new} = 42120 \, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 2975 \, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Positive Steel | $As_{pos} = 5.15 \, in^2$ |
| Area of Negative Steel | $As_{neg} = 2.01 \, in^2$ |
| Distance to bar centroid | $yt = 1.25 \, in$ |
| Distance between 2 layers of bars | $y := 1.5 \cdot in$ |

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| | |
|---|---|
| Effective Depths | $d = 17.25\,in$ |
| Gross Mom. of Inertia | $Ig = 9333.33\,in^4$ |
| Steel Percentage | $\rho = 0.02$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 8.23\,in$ |
| Cracked Mom. of Inertia | $Ic = 6868.43\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 8100.88\,in^4$ |
| Beam Weight | $Wb = 5833.33\,lb$ |
| Slab Weight | $Ws = 24870\,lb$ |
| Live Load Weight | $WLl = 4145\,lb$ |
| Total Weight | $Wt = 34848.33\,lb$ |
| Total Mass | $M = 1083.12\,\frac{lb\,sec^2}{ft}$ |

MODEL PROPERTIES

| | |
|---|---|
| Ultimate Positive Moment | $Mu_{pos} = 346747.15\,lb\,ft$ |
| Ultimate Negative Moment | $Mu_{neg} = 135396.51\,lb\,ft$ |
| Elastic Stiffness | $Ke = 1.54 \times 10^6\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 158009.13\,lb$ (Fixed Ends) (Downward pressure) |
| Elastic Limit Displacement | $Xe = 1.23\,in$ |
| Dead Load Displacement | $Xdl = 0.27\,in$ |

PERIOD OF VIBRATION

| | |
|---|---|
| Load Mass Factor | (TM5-1300, Table 3-12) |



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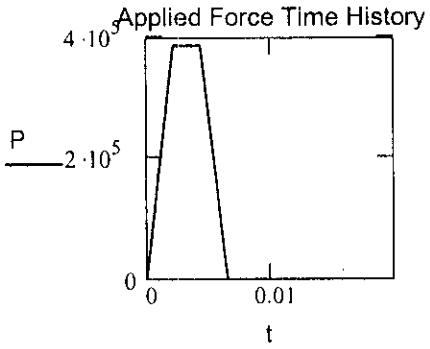
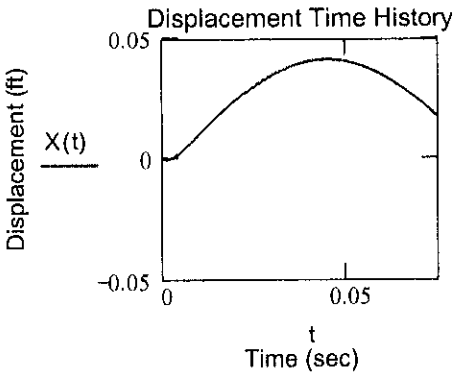
| | | |
|---|---|---|
| Period of Vibration | | $\omega = 42.68\,Hz$ |
| Circular Frequency | | $T = 0.15\,sec$ |

LOAD TIME HISTORY

| | | |
|---|---|---|
| Incident Pressure | $Ps := 13.30 \cdot psi$ | Range is 32.17'. |
| Incident Impulse | $Is := 35.55 \cdot psi \cdot msec$ | Horiz dist = 30.23', Vert dist = 11' to bottom of beam |
| Shock Front Velocity | $U := 1490 \cdot \frac{ft}{sec}$ | Horiz dist = 13.4' standoff + 16.83' bay size |
| LUWA Reduction Factor | $rf := 0.61$ | (Window height= 4'-6") |
| | | (Room height= 12'-1") |

| | |
|---|---|
| Reduced Pressure | $Pre = 8.11\,psi$ |
| Total Duration | $td = 6.57\,msec$ |
| Rise Time | $tr = 2.19\,msec$ |
| Decay Time | $tp = 4.38\,msec$ |
| Total Force | $F1 = 387399\,lb$ |




Effective Mass $Me = 844.83 \frac{lb\,sec^2}{ft}$

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| | | |
|---|---|---|
| Dynamic Displacement | $Xd = 0.5\,in$ | |
| Maximum Displacement | $Xm = 0.77\,in$ | |
| Ductility | $\mu = 0.51$ | < 15 => ok |
| Max Support Rotation | $\theta = 0.37\,deg$ | < 2 deg => ok |

SHEAR CHECK

| | | |
|---|---|---|
| Shear from Ru | $Vu = 79004.57\,lb$ | |
| Concrete Shear Capacity | $Vc = 26344.54\,lb$ | |
| Shear Ratio | $\lambda v = 0.33$ | < 1 => stirrups required |

SHEAR STEEL CHECK

Existing Stirrups

| | | |
|---|---|---|
| Shear Reinf. Area (1/4"dia) | $Av := 0.049 \cdot in^2$ | |
| Shear Reinf. Spacing | $sv := 6 \cdot in$ | |
| Number of Legs | $nv := 2$ | |
| Stirrup Shear Capacity | $Vs = 13185.9\,lb$ | |

New Shear Plate

| | | |
|---|---|---|
| Plate Thickness | $t_s := 0.25 \cdot in$ | |
| Plate Depth | $t_d := 10 \cdot in - 2 \cdot in$ | (subtract bolt holes) |
| Number of Plates | $n_p := 2$ | |
| Plate Shear Capacity | $Vp = 92664\,lb$ | |

Total Shear Capacity $Vn = 1.32 \times 10^5\,lb$

$\lambda = 1.67$ >1 => OK

HE

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CHECK BALANCED DESIGN

Ultimate Reaction from Slabs

$Mu_s := 896 \cdot lb \cdot ft$ (per 2 inch strip of interior slab width, see slab calcs)

$Mu_{slab} := Mu_s \cdot \frac{12 \cdot in}{2 \cdot in}$ $Mu_{slab} = 5376\,lb\,ft$ (per 1 ft strip of slab)

Inner Bay Slab Length $L_{in} := 16.33 \cdot ft$

Outer Bay Slab Length $L_{out} := 16.83 \cdot ft$

From Inner Slab $Ru_{in} = 2633.68\,lb$ (per 1 ft strip of slab)

From Outer Slab $Ru_{out} = 2555.44\,lb$ (per 1 ft strip of slab)

Total Reaction $Ru_{tot} = 103782.34\,lb$

Reaction Ratio $\lambda r = 1.52$ > 1 => OK



LIMITED OFFICIAL USE

HE

San Francisco, California 94103

6 inch shotcrete wall retrofit
26' reflective
16' incident

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

$psf := lb \cdot ft^{-2}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Bar Diameter | $db := 0.75 \cdot in$ | Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Wall Thickness | $h := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Bar Spacing | $b := 6 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Compression Steel | $Asc := 0 \cdot in^2$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 3.12 \times 10^6 lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 71400 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 3510 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.44 in^2$ |
| Reinforcement Location | $d = 3 in$ |
| Compression Block | $a = 1.76 in$ |
| Steel Percentage | $\rho = 0.02$ |
| Ultimate Moment | $Mu = 5569.92 lb ft$ |
| Ultimate Resistance | $Ru = 3682.59 lb$ |
| Gross Mom. of Inertia | $Ig = 108 in^4$ |
| Modular Ratio | $n = 9.29$ |
| Neutral Axis of Transformed Section | $kd = 1.46 in$ |

| | | |
|---|---|---|
| Cracked Mom. of Inertia | $Ic = 14.4 in^4$ | |
| Avg. Mom. of Inertia | $Ia = 61.2 in^4$ | (TM5-1300 Equation 4-7) |

Weight on wall

| | | | |
|---|---|---|---|
| Roof Dead Load | $DLr := 20 \cdot psf$ | Slab Tributary width | $s1 := 8.42 \cdot ft$ |
| Floor Live Load | $LL := 100 \cdot psf$ | Wall length | $L := 5 \cdot ft$ |
| Roof Live Load | $LLr := 20 \cdot psf$ | Number of Floors Above | $n_f := 2$ |
| | | Slab Thickness | $t_s := 6 \cdot in$ |
| Roof Tributary Length | $r1 := 20 \cdot ft$ | Existing 3rd floor Wall thickness | $t_{w6} := 6 \cdot in$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ | Existing 1st/2nd floor Wall thickness | $t_{w8} := 8 \cdot in$ |

Load on 5' length of wall

| | |
|---|---|
| Weight of Roof Load | $Wdl_r = 12168 lb$ |
| Weight Roof Live Load | $Wll_r = 6084 lb$ |
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 6315 lb$ |
| Weight of Live Load at 3rd and 2nd floors | $Wll_f = 4210 lb$ |
| Weight of existing wall above | $Wwall_{23} = 10587.5 lb$ |
| Weight of shotcrete wall above | $Wshot_{23} = 9075 lb$ |
| Weight of 1st floor existing wall | $Wwall_1 = 6050 lb$ |
| Weight of 1st floor shotcrete wall | $Wshot_1 = 4537.5 lb$ |
| Sum of Loads | $Psum = 59027 lb$ |

Load on 6" strip of wall $Ptot = 5902.7 lb$

MODEL PROPERTIES

| | |
|---|---|
| Wall Weight | $Wt = 1058.75 lb$ |
| Total Mass | $M = 32.91 \frac{lb sec^2}{ft}$ |
| Elastic Stiffness | $Ke = 57521.91 \frac{lb}{ft}$ |

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Elastic Limit Displacement $Xe = 0.77\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .72$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 49.27\,Hz$

Circular Frequency $T = 0.13\,sec$

LOAD TIME HISTORY

Eq. Uniform Pressure $Pr := 63.12 \cdot psi$ Range of 26' - reflective

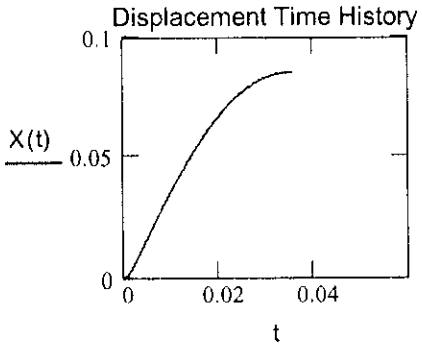
Eq. Uniform Impulse $Ir := 107.0 \cdot psi \cdot msec$ (or range of 16' - incident)

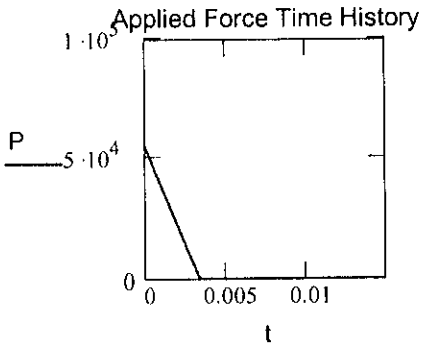
Incident Load Duration $td = 3.39\,msec$

Total Load $F1 = 54990.14\,lb$

RESPONSE

Equivalent Mass $Me = 23.69 \frac{lb\,sec^2}{ft}$




Maximum Displacement $Xm = 1.03\,in$

Displacement Ductility $\mu = 1.34$ <15 OK

Peak Support Rotation $\theta = 1.96\,deg$ < 2 deg => OK

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| | | | |
|---|---|---|---|
| Shear from Ru | | $Va = 1841.3\,lb$ | |
| Shear capacity of new wall | | $Vc = 2132.83\,lb$ | > Va => OK |
| P Delta Moment | | $Mp = 505.11\,lb\,ft$ | |
| | < | $Mu = 5569.92\,lb\,ft$ | OK |
| Concrete Compressive Capacity | | $Pc = 1.07 \times 10^5\,lb$ | |
| | > | $Ptot = 5.9 \times 10^3\,lb$ | OK |
| Buckling Capacity Load | | $Pb = 8.945 \times 10^4\,lb$ | |
| | > | $Ptot = 5.9 \times 10^3\,lb$ | OK |



LIMITED OFFICIAL USE

San Francisco, California 94103

8 inch shotcrete wall retrofit
18.39' reflective

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

$psf := lb \cdot ft^{-2}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Bar Diameter | $db := 0.75 \cdot in$ | Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Bar Spacing | $b := 6 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Compression Steel | $Asc := 0 \cdot in^2$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |

$Ec = 3.12 \times 10^6 \, lb \cdot in^{-2}$

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 71400 \, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 3510 \, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.44 \, in^2$ |
| Reinforcement Location | $d = 4 \, in$ |
| Compression Block | $a = 1.76 \, in$ |
| Steel Percentage | $\rho = 0.02$ |
| Ultimate Moment | $Mu = 8198.55 \, lb \, ft$ |
| Ultimate Resistance | $Ru = 5420.53 \, lb$ |
| Gross Mom. of Inertia | $Ig = 256 \, in^4$ |
| Modular Ratio | $n = 9.29$ |
| Neutral Axis of Transformed Section | $kd = 1.75 \, in$ |

Cracked Mom. of Inertia $Ic = 28.8\,in^4$

Avg. Mom. of Inertia $Ia = 142.4\,in^4$ (TM5-1300 Equation 4-7)

Weight on wall

| | | | |
|---|---|---|---|
| Roof Dead Load | $DLr := 20 \cdot psf$ | Slab Tributary width | $s1 := 8.42 \cdot ft$ |
| Floor Live Load | $LL := 100 \cdot psf$ | Wall length | $L := 5 \cdot ft$ |
| Roof Live Load | $LLr := 20 \cdot psf$ | Number of Floors Above | $n_f := 2$ |
| | | Slab Thickness | $t_s := 6 \cdot in$ |
| Roof Tributary Length | $r1 := 20 \cdot ft$ | Existing 3rd floor Wall thickness | $t_{w6} := 6 \cdot in$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ | Existing 1st/2nd floor Wall thickness | $t_{w8} := 8 \cdot in$ |

Load on 5' length of wall

| | |
|---|---|
| Weight of Roof Load | $Wdl_r = 12168\,lb$ |
| Weight Roof Live Load | $Wll_r = 6084\,lb$ |
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 6315\,lb$ |
| Weight of Live Load at 3rd and 2nd floors | $Wll_f = 4210\,lb$ |
| Weight of existing wall above | $Wwall_{23} = 10587.5\,lb$ |
| Weight of shotcrete wall above | $Wshot_{23} = 12100\,lb$ |
| Weight of 1st floor existing wall | $Wwall_1 = 6050\,lb$ |
| Weight of 1st floor shotcrete wall | $Wshot_1 = 6050\,lb$ |
| Sum of Loads | $Psum = 63564.5\,lb$ |

$Ptot = 6356.45\,lb$

Load on 6" strip of wall

MODEL PROPERTIES

| | |
|---|---|
| Wall Weight | $Wt = 1210\,lb$ |
| Total Mass | $M = 37.61\,\frac{lb\,sec^2}{ft}$ |
| Elastic Stiffness | $Ke = 133841.45\,\frac{lb}{ft}$ |

Elastic Limit Displacement $Xe = 0.49\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .72$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 70.31\,Hz$

Circular Frequency $T = 0.09\,sec$

LOAD TIME HISTORY

Eq. Uniform Pressure $Pr := 173.8 \cdot psi$ Range of 18.39' - reflective

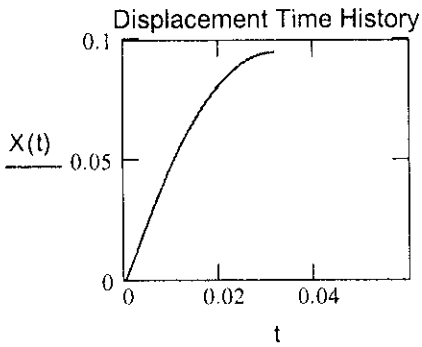
Eq. Uniform Impulse $Ir := 162.3 \cdot psi \cdot msec$

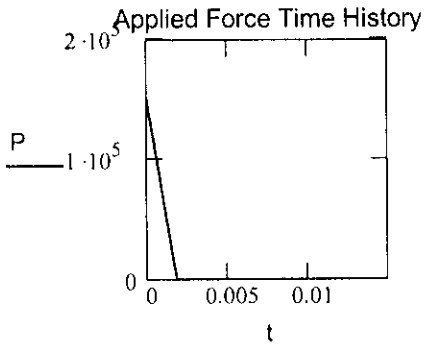
Incident Load Duration $td = 1.868\,msec$

Total Load $F1 = 151414.56\,lb$

RESPONSE

Equivalent Mass $Me = 27.08 \frac{lb\,sec^2}{ft}$




Maximum Displacement $Xm = 1.14\,in$

Displacement Ductility $\mu = 2.35$ <15 OK

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8 inch shotcrete wall retrofit
19.5' reflective
3.5' incident

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

$psf := lb \cdot ft^{-2}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Bar Diameter | $db := 0.75 \cdot in$ | Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Wall Thickness | $h := 8 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Bar Spacing | $b := 6 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Compression Steel | $Asc := 0 \cdot in^2$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 3.12 \times 10^6 lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 71400 lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 3510 lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | | |
|---|---|---|
| Steel Area | $As := \frac{db^2 \cdot \pi}{4}$ | $As = 0.44 in^2$ |
| Reinforcement Location | $d := h \cdot 0.5$ | $d = 4 in$ |
| Compression Block | $a := \frac{As \cdot fdy}{0.85 \cdot fdc \cdot b}$ | $a = 1.76 in$ |
| Steel Percentage | $\rho := \frac{As}{d \cdot b}$ | $\rho = 0.02$ |
| Ultimate Moment | $Mu := fdy \cdot As \cdot \left(d - \frac{a}{2}\right)$ | $Mu = 8198.55 lb ft$ |
| Ultimate Resistance | $Ru := \frac{8 \cdot Mu}{H}$ | $Ru = 5420.53 lb$ |
| Gross Mom. of Inertia | $Ig := \frac{h^3 \cdot b}{12}$ | $Ig = 256 in^4$ |
| Modular Ratio | $n := \frac{Es}{Ec}$ | $n = 9.29$ |
| Try | $kd := \frac{h}{2}$ | $yt := d$ |

Neutral Axis of Transformed Section $kd := root\left[\left[\frac{yt \cdot Asc \cdot (n-1) + kd^2 \cdot b \cdot 0.5 + d \cdot As \cdot n}{kd \cdot b + n \cdot As + (n-1) \cdot Asc}\right] - kd, kd\right]$ $kd = 1.75\,in$

Cracked Mom. of Inertia $Ic := b \cdot \frac{kd^3}{4} + (n-1) \cdot Asc \cdot (kd - yt)^2 + n \cdot As \cdot (d - kd)^2$ $Ic = 28.8\,in^4$

Avg. Mom. of Inertia $Ia := (Ig + Ic) \cdot 0.5$ $Ia = 142.4\,in^4$ (TM5-1300 Equation 4-7)

Weight on wall

| | | | |
|---|---|---|---|
| Roof Dead Load | $DLr := 20 \cdot psf$ | Slab Tributary width | $s1 := 8.42 \cdot ft$ |
| Floor Live Load | $LL := 100 \cdot psf$ | Wall length | $L := 5 \cdot ft$ |
| Roof Live Load | $LLr := 20 \cdot psf$ | Number of Floors Above | $n_f := 2$ |
| | | Slab Thickness | $t_s := 6 \cdot in$ |
| Roof Tributary Length | $r1 := 20 \cdot ft$ | Existing 3rd floor Wall thickness | $t_{w6} := 6 \cdot in$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ | Existing 1st/2nd floor Wall thickness | $t_{w8} := 8 \cdot in$ |

Load on 5' length of wall

| | |
|---|---|
| Weight of Roof Load | $Wdl_r = 12168\,lb$ |
| Weight Roof Live Load | $Wll_r = 6084\,lb$ |
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 6315\,lb$ |
| Weight of Live Load at 3rd and 2nd floors | $Wll_f = 4210\,lb$ |
| Weight of existing wall above | $Wwall_{23} = 10587.5\,lb$ |
| Weight of shotcrete wall above | $Wshot_{23} = 12100\,lb$ |
| Weight of 1st floor existing wall | $Wwall_1 = 6050\,lb$ |
| Weight of 1st floor shotcrete wall | $Wshot_1 = 6050\,lb$ |
| Sum of Loads | $Psum = 63564.5\,lb$ |

Load on 6" strip of wall $Ptot = 6356.45\,lb$

MODEL PROPERTIES

Wall Weight $Wt = 1210\,lb$

Total Mass $M = 37.61\,\frac{lb\,sec^2}{ft}$

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Elastic Stiffness $Ke = 133841.45 \frac{lb}{ft}$

Elastic Limit Displacement $Xe = 0.49\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .72$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 70.31\,Hz$

Circular Frequency $T = 0.09\,sec$

LOAD TIME HISTORY

Eq. Uniform Pressure $Pr := 145.6 \cdot psi$ Range of 19.5' - reflective

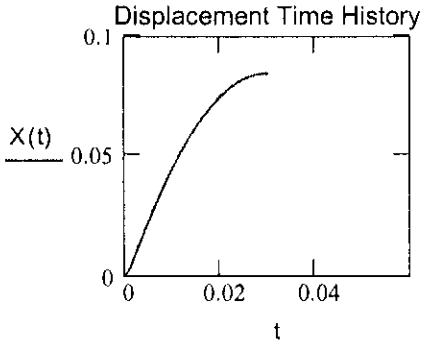
Eq. Uniform Impulse $Ir := 151.0 \cdot psi \cdot msec$ (or range of 3.5' - incident)

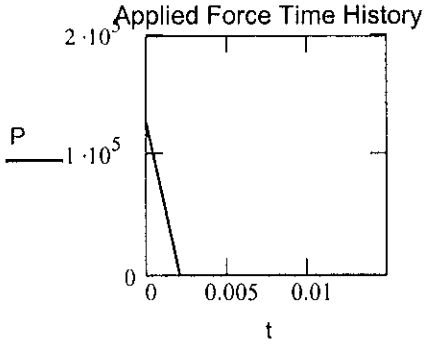
Incident Load Duration $td = 2.074\,msec$

Total Load $F1 = 126846.72\,lb$

RESPONSE

Equivalent Mass $Me = 27.08 \frac{lb\,sec^2}{ft}$




Maximum Displacement $Xm = 1.01\,in$

Displacement Ductility $\mu = 2.08$ <15 OK

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| | | | |
|---|---|---|---|
| Peak Support Rotation | | $\theta = 1.93\,\text{deg}$ | < 2 deg => OK |
| Shear from Ru | | $Va = 2710.26\,\text{lb}$ | |
| Shear capacity of new wall | | $Vc = 2843.77\,\text{lb}$ | > Va => OK |
| P Delta Moment | | $Mp = 536.18\,\text{lb ft}$ | |
| | < | $Mu = 8198.55\,\text{lb ft}$ | OK |
| Concrete Compressive Capacity | | $Pc = 1.43 \times 10^5\,\text{lb}$ | |
| | > | $Ptot = 6.36 \times 10^3\,\text{lb}$ | OK |
| Buckling Capacity Load | | $Pb = 2.081 \times 10^5\,\text{lb}$ | |
| | > | $Ptot = 6.36 \times 10^3\,\text{lb}$ | OK |



LIMITED OFFICIAL USE

San Francisco, California 94103

10 inch shotcrete wall retrofit
13.4' reflective

$psi := lb \cdot in^{-2}$

$msec := 10^{-3} \cdot sec$

$psf := lb \cdot ft^{-2}$

| | | | |
|---|---|---|---|
| Wall Height | $H := 12.1 \cdot ft$ | Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Bar Diameter | $db := 0.75 \cdot in$ | Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Wall Thickness | $h := 10 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot lb \cdot in^{-2}$ |
| Bar Spacing | $b := 6 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Cover Depth | $c := 1.5 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | | | $Ec = 3.12 \times 10^{6}\, lb \cdot in^{-2}$ |

DYNAMIC MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Dyn. Increase Factor | $DIFs := 1.19$ | |
| Concrete DIF | $DIFc := 1.17$ | (TM5-1300, Table 4-1) |
| Dynamic Yield Strength | $fdy := DIFs \cdot fy$ | $fdy = 71400\, lb \cdot in^{-2}$ |
| Dynamic Comp. Strength | $fdc := DIFc \cdot fc$ | $fdc = 3510\, lb \cdot in^{-2}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Steel Area | $As = 0.44\, in^2$ |
| Centroid Depth | $yt = 0.68\, ft$ |
| Effective Depths | $d = 8.13\, in$ |
| | $de = 6.25\, in$ |
| Ultimate Moment | $Mu = 16428.93\, lb\, ft$ |
| Steel Percentage | $\rho = 0.01$ |
| Ultimate Resistance | $Ru = 10862.11\, lb$ |
| Gross Mom. of Inertia | $Ig = 500\, in^4$ |
| Modular Ratio | $n = 9.29$ |
| Neutral Axis of Transformed Section | $kd = 3.47\, in$ |

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| | | |
|---|---|---|
| Cracked Mom. of Inertia | $Ic = 230.92\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 365.46\,in^4$ | (TM5-1300 Equation 4-7) |

Weight on wall

| | | | |
|---|---|---|---|
| Roof Dead Load | $DLr := 20 \cdot psf$ | Slab Tributary width | $s1 := 8.42 \cdot ft$ |
| Floor Live Load | $LL := 100 \cdot psf$ | Wall length | $L := 5 \cdot ft$ |
| Roof Live Load | $LLr := 20 \cdot psf$ | Number of Floors Above | $n_f := 2$ |
| | | Slab Thickness | $t_s := 6 \cdot in$ |
| Roof Tributary Length | $r1 := 20 \cdot ft$ | Existing 3rd floor Wall thickness | $t_{w6} := 6 \cdot in$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ | Existing 1st/2nd floor Wall thickness | $t_{w8} := 8 \cdot in$ |

Load on 5' length of wall

| | |
|---|---|
| Weight of Roof Load | $Wdl_r = 12168\,lb$ |
| Weight Roof Live Load | $Wll_r = 6084\,lb$ |
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 6315\,lb$ |
| Weight of Live Load at 3rd and 2nd floors | $Wll_f = 4210\,lb$ |
| Weight of existing wall above | $Wwall_{23} = 10587.5\,lb$ |
| Weight of shotcrete wall above | $Wshot_{23} = 15125\,lb$ |
| Weight of 1st floor existing wall | $Wwall_1 = 6050\,lb$ |
| Weight of 1st floor shotcrete wall | $Wshot_1 = 7562.5\,lb$ |
| Sum of Loads | $Psum = 68102\,lb$ |

Load on 6" strip of wall

$Ptot = 6810.2\,lb$

MODEL PROPERTIES

| | |
|---|---|
| Wall Weight | $Wt = 1361.25\,lb$ |
| Total Mass | $M = 42.31\,\frac{lb\,sec^2}{ft}$ |
| Elastic Stiffness | $Ke = 343493.32\,\frac{lb}{ft}$ |

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Elastic Limit Displacement $Xe = 0.38\,in$

PERIOD OF VIBRATION

Load Mass Factor $Klm := .72$ (TM5-1300, Table 3-12)

Period of Vibration $\omega = 106.19\,Hz$

Circular Frequency $T = 0.06\,sec$

LOAD TIME HISTORY

Eq. Uniform Pressure $Pr := 453.5 \cdot psi$ Range of 13.4' - reflective

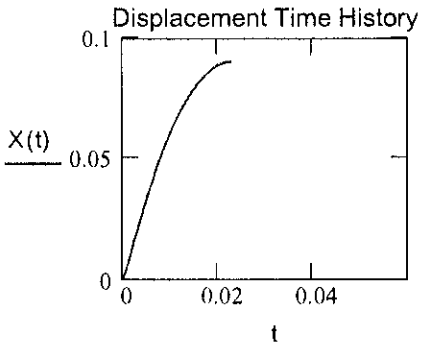
Eq. Uniform Impulse $Ir := 241.5 \cdot psi \cdot msec$

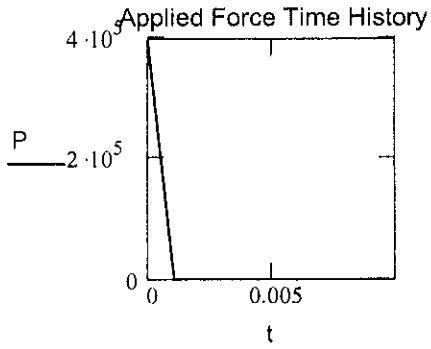
Incident Load Duration $td = 1.065\,msec$

Total Load $F1 = 395089.2\,lb$

RESPONSE

Equivalent Mass $Me = 30.46 \frac{lb\,sec^2}{ft}$




Maximum Displacement $Xm = 1.08\,in$

Displacement Ductility $\mu = 2.86$ <15 OK

San Francisco, California 94103

| | | | |
|---|---|---|---|
| Peak Support Rotation | | $\theta = 2.07\,\text{deg}$ | about 2 deg => OK |
| Shear from Ru | | $Va = 5431.05\,\text{lb}$ | |
| Shear capacity of new wall | | $Vc = 5776.41\,\text{lb}$ | < Va => OK |
| P Delta Moment | | $Mp = 614.86\,\text{lb ft}$ | |
| | < | $Mu = 16428.93\,\text{lb ft}$ | OK |
| Concrete Compressive Capacity | | $Pc = 1.79 \times 10^5\,\text{lb}$ | |
| | > | $Ptot = 6.81 \times 10^3\,\text{lb}$ | OK |
| Buckling Capacity Load | | $Pb = 5.341 \times 10^5\,\text{lb}$ | |
| | > | $Ptot = 6.81 \times 10^3\,\text{lb}$ | OK |



LIMITED OFFICIAL USE

HE

San Francisco, California 94103

Schofiled Barracks
Building 355 - Progressive Collapse
Existing Exterior Beam 3rd Floor - **No Good**
(Beam supports 3rd floor and roof loads)

$psi := lb \cdot in^{-2}$

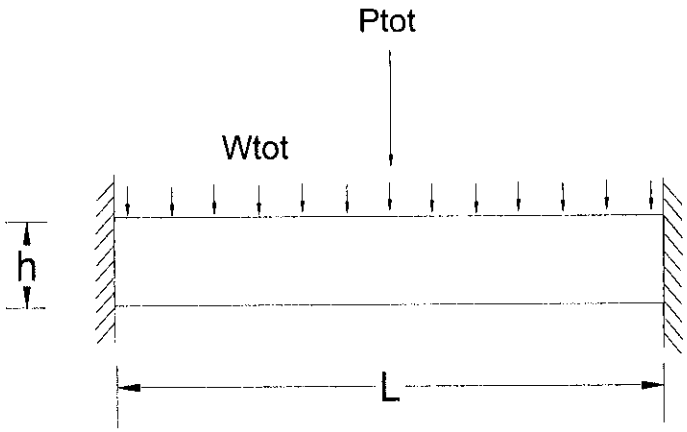
$psf := lb \cdot ft^{-2}$

$msec := 10^{-3} \cdot sec$

| | |
|---|---|
| Beam Length (wo col) | $L := 36 \cdot ft$ |
| Beam Depth (total) | $h := 27 \cdot in$ |
| Beam Width | $b := 6 \cdot in$ |
| Cover Depth | $c := 1.125 \cdot in$ |
| Slab Thickness | $t := 4 \cdot in$ |
| Tension Rebar Diameter | $db := 0.75 \cdot in$ |
| Number of Positive Tension Bars | $np := 3$ |
| Number of Negative Tension Bars | $nn := 1$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6}\, psi$ |
| Shear Reinforcement Dia. | $dv := 0.25 \cdot in$ |

| | |
|---|---|
| Column Depth | $hc := 10 \cdot in$ |
| Column Width | $bc := 48 \cdot in$ |
| Column Length (removed at 1st floor) | $Lc := 12.5 \cdot ft$ |
| Slab Tributary Length | $s1 := 20 \cdot ft$ |
| Slab Tributary Width | $s2 := 5.83 \cdot ft$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live load | $LLf := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Girder Depth | $hg := 10 \cdot in$ |
| Roof Girder Width | $wg := 10 \cdot in$ |
| Parapet Height | $hp := 4.7 \cdot ft$ |
| Parapet Width | $wp := 6 \cdot in$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000\, lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750\, lb \cdot in^{-2}$ |

Point load at midspan of beam

| | |
|---|---|
| Weight of column at 3rd floor: | $Wcol = 6250\, lb$ |
| Weight of Roof wall | $Wwall = 7050\, lb$ |
| Weight of Roof | |

| | |
|---|---|
| Weight of Roof | $Wroof = 2332\,lb$ |
| Roof Girders | $Wrgird = 2691\,lb$ |
| Weight Dead Load | $Wdl = 460\,\frac{lb}{ft}$ |
| Weight Live Load | $Wll = 292\,\frac{lb}{ft}$ |
| Sum ofl Point Loads | $Psum = 19489\,lb$ |
| Impact Factor | $IF := 2$ |
| Total Point Load | $Ptot = 38977\,lb$ |

Distributed load along span of beam

| | |
|---|---|
| Weight of Slab at 3rd floor: | $Wslab = 291\,\frac{lb}{ft}$ |
| Self Weight of Beam | $Wself = 169\,\frac{lb}{ft}$ |
| Weight Dead Load | $Wdl = 460\,\frac{lb}{ft}$ |
| Weight Live Load | $Wll = 292\,\frac{lb}{ft}$ |
| Sum of Distributed Load | $Wsum = 752\,\frac{lb}{ft}$ |
| Impact Factor | $IF := 2$ |
| Total Distributed Load | $Wtot = 1503\,\frac{lb}{ft}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Tension Steel Bar | $Ab = 0.442\,in^2$ |
| Area of PositiveTension Steel | $As = 1.325\,in^2$ |
| Effective Depths | $yt = 1.75\,in$ |
| | $d = 25\,in$ |
| | $de = 24\,in$ |

Beam Moment Capacity

AT MIDSPAN:

| | |
|---|---|
| Tension Steel Area | $Ast_m = 1.33\,in^2$ |
| Ultimate Moment Capacity at Midspan | $Mu_m = 114202\,lb\,ft$ |
| Midspan Moment due to Point Load | $M_p = 175398\,lb\,ft$ |
| Midspan Moment due to Distributed Load | $M_w = 81189\,lb\,ft$ |

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Total Midspan Moment demand — $Mtot = 256587\,lb\,ft$

$Mtot > Mu$ No Good

AT SUPPORTS:

Tension Steel Area — $Ast_s = 0.44\,in^2$

Ultimate Moment Capacity at Supports — $Mu_s = 38067\,lb\,ft$

(Since capacity fails at midspan, do not need to check moment at supports.)

Ductility and Rotation

Gross Mom. of Inertia — $Ig = 9841\,in^4$

Elastic Stiffness — $Ke = 801562\,\frac{lb}{ft}$

Ultimate Resistance — $Ru = 16919\,lb$

Steel Percentage — $\rho = 0.009$

Modular Ratio — $n = 10$

Neutral Axis of Transformed Section — $kd = 9\,in$

Cracked Mom. of Inertia — $Ic = 5011\,in^4$

Avg. Mom. of Inertia — $Ia = 7426\,in^4$

Totat Force — $P = 46552\,lb$

Equivalent Ductiltiy — $\mu = -0.29$

Ductility less than 0. Total force greater than Ru. No Good

HE

Date 1/22/2003

San Francisco, California 94103

Schofiled Barracks
Building 355 - Progressive Collapse
Corridor Column - Unbraced Length **OK**

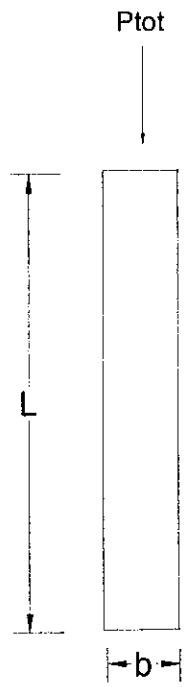
vc

$psf := lb \cdot ft^{-2}$

$psi := lb \cdot in^{-2}$

| | | | |
|---|---|---|---|
| Column Depth | $h := 10 \cdot in$ | Conc. Comp. Strength | $fc := 2500 \cdot psi$ |
| Column Width | $b := 48 \cdot in$ | Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Floor to Floor Height | $h_{ff} := 12.58 \cdot ft$ | Steel Modulus of Elast. | $Es := 29000000 \cdot psi$ |
| Unbraced Length | $L := 2 \cdot h_{ff}$ | Conc. Mass Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| No. of Bars ea. side | $n := 3$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Shear Ties Diameter | $dt := 0.375 \cdot in$ | | $Ec = 2.85 \times 10^{6} psi$ |
| Tie Spacing | $st := 24 \cdot in$ | | |
| Concrete Cover | $c := 1.5 \cdot in$ | Reinforcing Bars Diameter | $db := 0.375 \cdot in$ |
| | | Number of Floors Above | $n_f := 2$ |

| | | |
|---|---|---|
| Beam Depth | $hg := 27 \cdot in$ | |
| Beam Width | $wg := 6 \cdot in$ | |
| Wall Depth | $hw := 68 \cdot in$ | |
| Wall Width | $ww := 6 \cdot in$ | |
| Slab Length | $s1 := 20 \cdot ft$ | |
| Slab Effective Width | $s2 := 5.4 \cdot ft$ | |
| Slab thickness | $ts := 4 \cdot in$ | |
| Roof Dead Load | $DLr := 20 \cdot psf$ | (conservative) |
| Floor Live Load | $LLf := 100 \cdot psf$ | |
| Roof Live Load | $LLr := 20 \cdot psf$ | |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Concrete Increase Factor | $IFc := 1.1$ | (from DoD INterim AT/FP Construction Standards, Guidance on Structural Requirements, March 5, 2001) |
| Steel. Increase Factor | $IFs := 1.1$ | |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750 psi$ |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000 psi$ |

Building Loads

| | |
|---|---|
| Weight of Columns Above | $Wcol = 6290\,lb$ |
| Weight of Wall Above | $Wwall = 8500\,lb$ |
| Weight of Roof | $Wroof = 2160\,lb$ |
| Weight of Slabs: | $Wslabs = 10800\,lb$ |
| Weight of Beams | $Wbeams = 6750\,lb$ |
| Self Weight of Column | $Wself = 12580\,lb$ |
| Weight Dead Load | $Wdl = 47080\,lb$ |
| Weight Live Load | $Wll = 11880\,lb$ |
| Total Tributary Weight | $Ptotal = 58960\,lb$ |
| Area of Steel | $As = 0.33\,in^2$ |
| Tension Steel Centroid | $yt = 2.06\,in$ |
| Effective Depths | $d = 7.94\,in$ |
| | $de = 5.87\,in$ |
| Gross Mom. of Inertia | $Ig = 4000\,in^4$ |
| Steel Percentage | $\rho = 0.001$ |
| Modular Ratio | $n = 10.18$ |
| Neutral Axis of Transformed Section | $kd = 1.05\,in$ |
| Cracked Mom. of Inertia | $Ic = 181.58\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 2090.79\,in^4$ |
| Concrete Compressive Capacity | $Pc = 1.12 \times 10^6\,lb$ |
| | $> \; Ptotal = 5.9 \times 10^4\,lb$ OK |
| Buckling Capacity Load | $Pb = 6.45 \times 10^5\,lb$ |
| | $> \; Ptotal = 5.9 \times 10^4\,lb$ OK |

San Francisco, California 94103

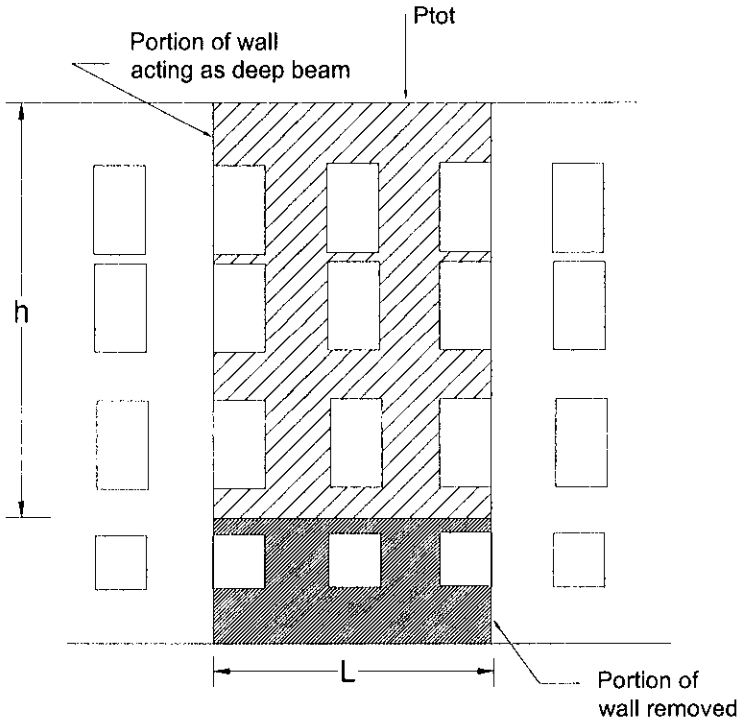
Schofiled Barracks
Building 355 - Progressive Collapse
Deep Beam at High Roof - **No Good**
(25' length of exterior wall removed at 1st floor)

VC

$psi := lb \cdot in^{-2}$ $psf := lb \cdot ft^{-2}$

| | |
|---|---|
| Beam Length (wo col) | $L := 25 \cdot ft$ |
| Beam Depth (total) | $h := 39.58 \cdot ft$ |
| Beam Width | $b := 8 \cdot in$ |
| Cover Depth | $c := 1.125 \cdot in$ |
| Slab Thickness | $t := 6 \cdot in$ |
| Tension Rebar Diameter | $db := 0.375 \cdot in$ |
| Number of Tension Bars | $np := 2$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live Load | $LL := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Tributary Width | $r1 := 20 \cdot ft$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ |
| Slab Tributary Width | $s1 := 20 \cdot ft$ |
| Slab Tributary Length | $s2 := 8.42 \cdot ft$ |
| Number of Floors Above | $n_f := 2$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Shear Reinforcement Dia. | $dv := 0.25 \cdot in$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6} psi$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000 lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750 lb \cdot in^{-2}$ |



LIMITED OFFICIAL USE

Point load on beam

| | |
|---|---|
| Weight of Roof Load | $Wdl = 3915 \frac{lb}{ft}$ |
| Weight Roof Live Load | $Wll = 842 \frac{lb}{ft}$ |
| Sum ofl Point Loads | $Psum = 18252\,lb$ |
| Impact Factor | $IF := 2$ |
| Total Point Load | $Ptot = 36504\,lb$ |

Distributed load along span of beam

| | |
|---|---|
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 1263 \frac{lb}{ft}$ |
| Self Weight of Deep Beam (assume 1/3 of wall area is windows) | $Wself = 2652 \frac{lb}{ft}$ |
| Weight Dead Load | $Wdl = 3915 \frac{lb}{ft}$ |
| Weight of Live Load at 2 floors | $Wll = 842 \frac{lb}{ft}$ |
| Sum of Distributed Load | $Wsum = 4757 \frac{lb}{ft}$ |
| Impact Factor | $IF := 2$ |
| Total Distributed Load | $Wtot = 9514 \frac{lb}{ft}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Tension Steel Bar | $Ab = 0.11\,in^2$ |
| Area of Tension Steel | $As = 0.221\,in^2$ |
| Effective Depths | $yt = 1.56\,in$ |
| | $d = 473\,in$ |

Beam Moment Check

| | |
|---|---|
| Tension Steel Force | $T = 9719\,lb$ |
| Concrete Force (compression) | $C_c = 9719\,lb$ |
| Estimate compression block depth | $a = 0.52\,in$ |

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Ultimate Moment Capacity $Mu = 383214\,lb\,ft$

Moment due to Point Load $M_p = 80491\,lb\,ft$

Moment due to Distributed Load $M_w = 247753\,lb\,ft$

Total Moment Demand $M_{tot} = 328244\,lb\,ft$

$M_{tot} < Mu$ OK

Moment at ends are larger, but since beam does not have the shear capacity (see below), there is no need to check end moments.

Beam Shear Check

Depth of beam for shear $d_v = 11.25\,ft$

(concrete below window will be removed)

Beam Shear Capacity $Vc = 113269\,lb$

Shear due to Point load $V_p = 28619\,lb$

Shear due to Distributed load $V_d = 118921\,lb$

Total Shear Demand $V_{tot} = 147541\,lb$

$V_{tot} > \phi V_c$ No Good

Ductility and Rotation

Gross Mom. of Inertia $Ig = 7 \times 10^7\,in^4$

Elastic Stiffness $Ke = 2 \times 10^{10}\,\frac{lb}{ft}$

Moment Capacity at Midspan

Moment Capacity at Supports

Ultimate Resistance $Ru = 122628\,lb$

Steel Percentage $\rho = 0$



LIMITED OFFICIAL USE

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| | | |
|---|---|---|
| Modular Ratio | $n = 10$ | |
| Neutral Axis of Transformed Section | $kd = 16\,in$ | |
| Cracked Mom. of Inertia | $Ic = 481584\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 4 \times 10^7\,in^4$ | |
| Totat Force | $P = 137173\,lb$ | |
| Equivalent Ductiltiy | $\mu = -4.22$ | Ductility less than 0. Total force greater than Ru. No Good |



LIMITED OFFICIAL USE

San Francisco, California 94103

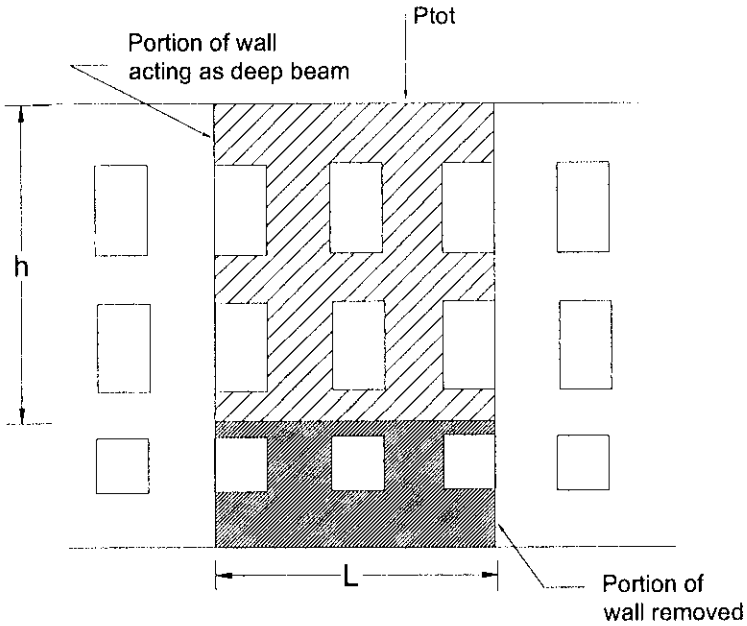
Schofiled Barracks
Building 355 - Progressive Collapse
Deep Beam at Low Roof - **No Good**
(25' length of exterior wall removed at 1st floor)

$psi := lb \cdot in^{-2}$ VC

$psf := lb \cdot ft^{-2}$

| | |
|---|---|
| Beam Length (wo col) | $L := 25 \cdot ft$ |
| Beam Depth (total) | $h := 29 \cdot ft$ |
| Beam Width | $b := 8 \cdot in$ |
| Cover Depth | $c := 1.125 \cdot in$ |
| Slab Thickness | $t := 6 \cdot in$ |
| Tension Rebar Diameter | $db := 0.375 \cdot in$ |
| Number of Tension Bars | $np := 2$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live Load | $LL := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Tributary Width | $r1 := 20 \cdot ft$ |
| Roof Tributary Length | $r2 := 8.42 \cdot ft$ |
| Slab Tributary Width | $s1 := 20 \cdot ft$ |
| Slab Tributary Length | $s2 := 8.42 \cdot ft$ |
| Roof Girder Depth | $hg := 10 \cdot in$ |
| Roof Girder Width | $wg := 10 \cdot in$ |
| Number of Floors Above | $n_f := 2$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Shear Reinforcement | $dv := 0.25 \cdot in$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6}\, psi$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000\, lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750\, lb \cdot in^{-2}$ |



LIMITED OFFICIAL USE

Point loads on beam

| | |
|---|---|
| Weight of Roof Load | $Wroof = 3368\,lb$ |
| Weight Roof Live Load | $Wll = 842\,\frac{lb}{ft}$ |
| Weight of Roof girder | $Wgird = 877\,lb$ |
| Sum ofl Point Loads | $Psum = 5929\,lb$ |
| Impact Factor | $IF := 2$ |
| Total Point Load | $Ptot = 11858\,lb$ |

Distributed load along span of beam

| | |
|---|---|
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 1263\,\frac{lb}{ft}$ |
| Self Weight of Deep Beam (assume 1/3 of wall area is windows) | $Wself = 1943\,\frac{lb}{ft}$ |
| Weight Dead Load | $Wdl = 3206\,\frac{lb}{ft}$ |
| Weight of Live Load at 2 floors | $Wll = 842\,\frac{lb}{ft}$ |
| Sum of Distributed Load | $Wsum = 4048\,\frac{lb}{ft}$ |
| Impact Factor | $IF := 2$ |
| Total Distributed Load | $Wtot = 8096\,\frac{lb}{ft}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Tension Steel Bar | $Ab = 0.11\,in^2$ |
| Area of Tension Steel | $As = 0.221\,in^2$ |
| Effective Depths | $yt = 1.56\,in$ |
| | $d = 346\,in$ |

Beam Moment Check

| | |
|---|---|
| Tension Steel Force | $T = 9719\,lb$ |
| Concrete Force (compression) | $C_c = 9719\,lb$ |
| Estimate compression block depth | $a = 0.52\,in$ |

| | |
|---|---|
| Ultimate Moment Capacity | $Mu = 280384\,lb\,ft$ |
| Moment due to Point Load (at midspan) | $M_p = 26147\,lb\,ft$ |
| Moment due to Distributed Load (at midspan) | $M_w = 210833\,lb\,ft$ |
| Total Moment Demand | $M_{tot} = 236981\,lb\,ft$ |
| | $M_{tot} < Mu$ OK |

Moment at ends are larger, but since beam does not have the shear capacity (see below), there is no need to check end moments.

Beam Shear Check

| | |
|---|---|
| Depth of beam for shear | $d_v = 8.87\,ft$ (concrete below window will be removed) |
| Beam Shear Capacity | $Vc = 89306\,lb$ |
| Shear due to Point load | $V_p = 9297\,lb$ |
| Shear due to Distributed load | $V_d = 101200\,lb$ |
| Total Shear Demand | $V_{tot} = 110497\,lb$ |
| | $V_{tot} > V_c$ No Good |

Ductility and Rotation

| | |
|---|---|
| Gross Mom. of Inertia | $Ig = 3 \times 10^7\,in^4$ |
| Elastic Stiffness | $Ke = 7 \times 10^9\,\frac{lb}{ft}$ |
| Moment Capacity at Midspan | |
| Moment Capacity at Supports | |
| Ultimate Resistance | $Ru = 89723\,lb$ |
| Steel Percentage | $\rho = 0$ |

San Francisco, California 94103

| | | |
|---|---|---|
| Modular Ratio | $n = 10$ | |
| Neutral Axis of Transformed Section | $kd = 13\,in$ | |
| Cracked Mom. of Inertia | $Ic = 256000\,in^4$ | |
| Avg. Mom. of Inertia | $Ia = 1 \times 10^7\,in^4$ | |
| Totat Force | $P = 107129\,lb$ | |
| Equivalent Ductiltiy | $\mu = -2.58$ | Ductility less than 0. Total force greater than Ru. No Good |



LIMITED OFFICIAL USE

HE

San Francisco, California 94103

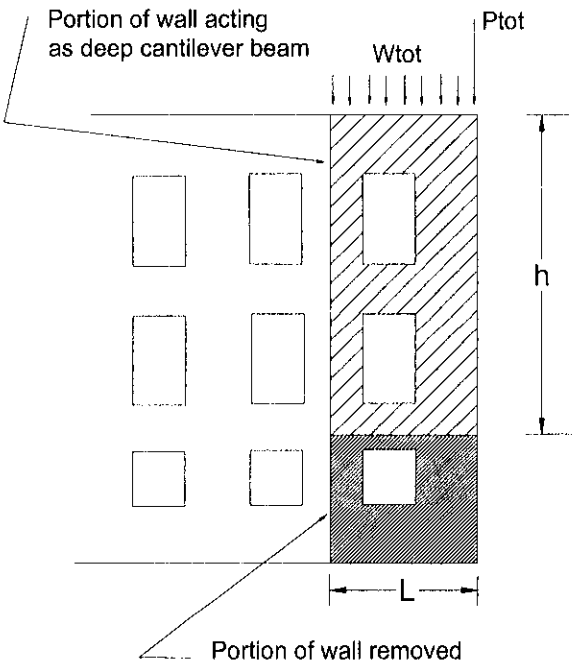
Schofiled Barracks
Building 355 - Progressive Collapse
Deep Cantilever Beam at Low Roof **-OK**
(12.5' length of exterior wall removed at corner of 1st floor)

$psi := lb \cdot in^{-2}$ VC

$psf := lb \cdot ft^{-2}$

| | |
|---|---|
| Beam Length (wo col) | $L := 12.5 \cdot ft$ |
| Beam Depth (total) | $h := 29.25 \cdot ft$ |
| Beam Width | $b := 8 \cdot in$ |
| Cover Depth | $c := 1.125 \cdot in$ |
| Slab Thickness | $t := 6 \cdot in$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ |
| Number of Negative Bars | $np := 4$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live Load | $LL := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Tributary Width | $r1 := 10 \cdot ft$ |
| Roof Tributary Length | $r2 := 8.42 \cdot ft$ |
| Slab Tributary Width | $s1 := 10 \cdot ft$ |
| Slab Tributary Length | $s2 := 8.42 \cdot ft$ |
| Roof Girder Depth | $hg := 10 \cdot in$ |
| Roof Girder Width | $wg := 10 \cdot in$ |
| Number of Floors Above | $n_f := 2$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Shear Reinforcement | $dv := 0.25 \cdot in$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6}\, psi$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000\, lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750\, lb \cdot in^{-2}$ |



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Point loads on beam

| | |
|---|---|
| Weight of Roof Load | $Wroof = 1684\,lb$ |
| Weight of Roof Live Load | $Wll = 842\,\frac{lb}{ft}$ |
| Weight of Roof girder | $Wgird = 877\,lb$ |
| Sum ofl Point Loads | $Psum = 3403\,lb$ |
| Impact Factor | $IF := 2$ |
| Total Point Load | $Ptot = 6806\,lb$ |

Distributed load along span of beam

| | |
|---|---|
| Weight of Slab at 3rd and 2nd floors: | $Wslab = 1263\,\frac{lb}{ft}$ |
| Self Weight of Deep Beam (assume 1/3 of wall area is windows) | $Wself = 1960\,\frac{lb}{ft}$ |
| Weight Dead Load | $Wdl = 3223\,\frac{lb}{ft}$ |
| Weight of Live Load at 2 floors | $Wll = 842\,\frac{lb}{ft}$ |
| Sum of Distributed Load | $Wsum = 4065\,\frac{lb}{ft}$ |
| Impact Factor | $IF := 2$ |
| Total Distributed Load | $Wtot = 8129\,\frac{lb}{ft}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Tension Steel Bar | $Ab = 0.196\,in^2$ |
| Area of Tension Steel | $As = 0.785\,in^2$ |
| Effective Depths | $yt = 1.62\,in$ |
| | $d = 349\,in$ |

Beam Moment Check

| | |
|---|---|
| Tension Steel Force | $T = 34558\,lb$ |
| Concrete Force (compression) | $C_c = 34558\,lb$ |
| Estimate compression block depth | $a = 1.85\,in$ |
| Ultimate Moment Capacity | $Mu = 1003467\,lb\,ft$ |



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Moment due to Point Load $M_p = 85077\,lb\,ft$

Moment due to Distributed Load $M_w = 635117\,lb\,ft$

Total Moment Demand $M_{tot} = 720194\,lb\,ft$

$M_{tot} < Mu$ OK

Beam Shear Check

At Windows: (concrete below window will be removed)

Depth of beam for shear $d_v = 29.11\,ft$

Beam Shear Capacity $Vc = 293142\,lb$

$Vs = 4312\,lb$

(A' beam: 24 in deep, with 1/4" stirrups at 12"o.c.)

$V = 297454\,lb$

Shear due to Point load $V_p = 6806\,lb$

Shear due to Distributed load $V_d = 101619\,lb$

Total Shear Demand $V_{tot} = 108425\,lb$

$V_{tot} < V$ OK

At Fixed end of Deep Cantilever Beam:

Depth of beam for shear $d_v = 29.11\,ft$

Beam Shear Capacity $Vc = 293142\,lb$

$Vs = 4312\,lb$

(A' beam: 24 in deep, with 1/4" stirrups at 12"o.c.)

$V = 297454\,lb$



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| | |
|---|---|
| Shear due to Point load | $V_p = 6806\,lb$ |
| Shear due to Distributed load | $V_d = 101619\,lb$ |
| Total Shear Demand | $V_{tot} = 108425\,lb$ |
| | $V_{tot} < V$ OK |

Ductility and Rotation

| | |
|---|---|
| Gross Mom. of Inertia | $Ig = 3 \times 10^7\,in^4$ |
| Elastic Stiffness | $Ke = 9 \times 10^8\,\frac{lb}{ft}$ |
| Ultimate Resistance | $Ru = 80277\,lb$ |
| Steel Percentage | $\rho = 0$ |
| Modular Ratio | $n = 10$ |
| Neutral Axis of Transformed Section | $kd = 25\,in$ |
| Cracked Mom. of Inertia | $Ic = 886464\,in^4$ |
| Avg. Mom. of Inertia | $Ia = 1 \times 10^7\,in^4$ |
| Totat Force | $P = 54212\,lb$ |
| Equivalent Ductiltiy | $\mu = 1.54$ |
| Elastic Limit Displacement | $Xe = 0.0011\,in$ |
| Peak Displacement | $Xm = 0.00169\,in$ |
| Support Rotation | $\theta = 0.00129\,deg$ < 6 deg. OK |



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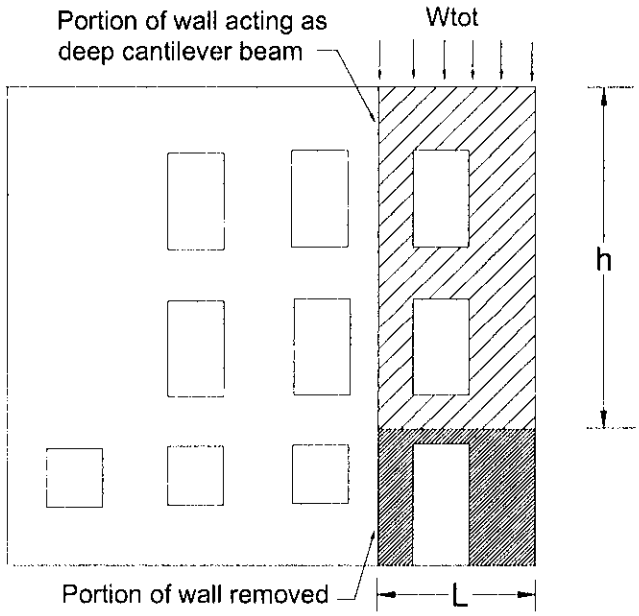
Schofiled Barracks
Building 355 - Progressive Collapse
Deep Cantilever Beam at Short Side - **OK**
(12.5' length of exterior wall removed at corner of 1st floor)

$psi := lb \cdot in^{-2}$ VC

$psf := lb \cdot ft^{-2}$

| | |
|---|---|
| Beam Length (wo col) | $L := 12.5 \cdot ft$ |
| Beam Depth (total) | $h := 29.25 \cdot ft$ |
| Beam Width | $b := 8 \cdot in$ |
| Cover Depth | $c := 1.125 \cdot in$ |
| Slab Thickness | $t := 6 \cdot in$ |
| Tension Rebar Diameter | $db := 0.5 \cdot in$ |
| Number of Negative Bars | $np := 4$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live Load | $LL := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Tributary Width | $r1 := 10 \cdot ft$ |
| Roof Tributary Length | $r2 := 8.42 \cdot ft$ |
| Slab Tributary Width | $s1 := 10 \cdot ft$ |
| Slab Tributary Length | $s2 := 8.42 \cdot ft$ |
| Roof Girder Depth | $hg := 10 \cdot in$ |
| Roof Girder Width | $wg := 10 \cdot in$ |
| Number of Floors Above | $n_f := 2$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 2500 \cdot psi$ |
| Steel Yield Strength | $fy := 40000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Shear Reinforcement | $dv := 0.25 \cdot in$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6}\, psi$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 44000\, lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 2750\, lb \cdot in^{-2}$ |

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Distributed load along span of beam

Weight of Roof Dead Load $Wroof = 200 \frac{lb}{ft}$

Weight of Roof girder $Wgird = 104 \frac{lb}{ft}$

Weight of Slab at 3rd and 2nd floors: $Wslab = 1500 \frac{lb}{ft}$

Self Weight of Deep Beam
(assume 1/3 of wall area is windows) $Wself = 1960 \frac{lb}{ft}$

Weight Dead Load $W_{DL} = 3764 \frac{lb}{ft}$

Weight of Live Load at 2 floors $Wfloor = 1000 \frac{lb}{ft}$

Weight of Roof Live Load $Wrooflive = 100 \frac{lb}{ft}$

Weight of Live Load $W_{LL} = 1100 \frac{lb}{ft}$

Sum of Distributed Load $Wsum = 4864 \frac{lb}{ft}$

Impact Factor $IF := 2$

Total Distributed Load $Wtot = 9728 \frac{lb}{ft}$

AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar $Ab = 0.196 in^2$

Area of Tension Steel $As = 0.785 in^2$

Effective Depths $yt = 1.62 in$

$d = 349 in$

Beam Moment Check

Tension Steel Force $T = 34558 lb$

Concrete Force (compression) $C_c = 34558 lb$

Estimate compression block depth $a = 1.85 in$

Ultimate Moment Capacity $Mu = 1 \times 10^6 lb\,ft$

Moment due to Distributed Load $M_w = 759987 lb\,ft$



LIMITED OFFICIAL USE

Total Moment Demand $M_{tot} = 759987\,lb\,ft$

$M_{tot} < Mu$ OK

Beam Shear Check

Depth of beam for shear $d_v = 16.11\,ft$

(concrete not removed below windows on short side)

Beam Shear Capacity $Vc = 162251\,lb$

Shear due to Distributed load

$V_d = 121598\,lb$

Total Shear Demand

$V_{tot} = 121598\,lb$

$V_{tot} < V_c$ OK

Ductility and Rotation

Gross Mom. of Inertia $Ig = 3 \times 10^7\,in^4$

Elastic Stiffness $Ke = 9 \times 10^8 \frac{lb}{ft}$

Ultimate Resistance $Ru = 80277\,lb$

Steel Percentage $\rho = 0$

Modular Ratio $n = 10$

Neutral Axis of Transformed Section $kd = 25\,in$

Cracked Mom. of Inertia $Ic = 886464\,in^4$

Avg. Mom. of Inertia $Ia = 1 \times 10^7\,in^4$

Totat Force $P = 60799\,lb$

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| | |
|---|---|
| Equivalent Ductiltiy | $\mu = 2.06$ |
| Elastic Limit Displacement | $Xe = 0.0011\,in$ |
| Peak Displacement | $Xm = 0.00227\,in$ |
| Support Rotation | $\theta = 0.00173\,deg$ <u>< 6 deg. OK</u> |

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Progressive Collapse
New Exterior Beam 3rd Floor - doweled into existing beam
(New beam supports 3rd floor, and roof loads)
Install same new beam next to 2nd floor existing beam

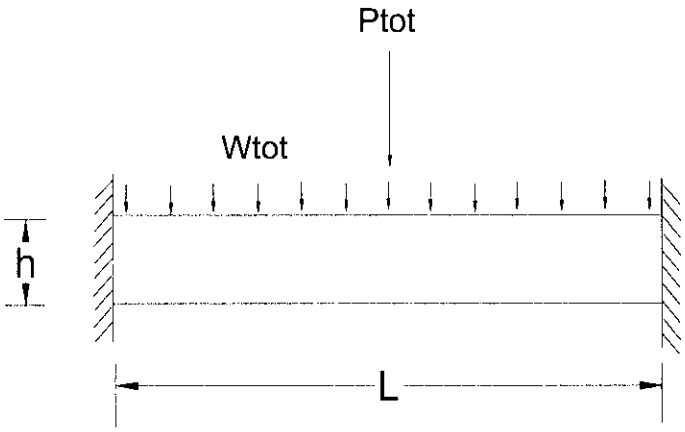
$psi := lb \cdot in^{-2}$

$psf := lb \cdot ft^{-2}$

$msec := 10^{-3} \cdot sec$

| | |
|---|---|
| Beam Length (wo col) | $L := 36 \cdot ft$ |
| Beam Depth (total) | $h := 23 \cdot in$ |
| Beam Width | $b := 15 \cdot in$ |
| Cover Depth | $c := 2 \cdot in$ |
| Slab Thickness | $t := 4 \cdot in$ |
| Tension Rebar Diameter | $db := 1 \cdot in$ |
| Number of Positive Tension Bars | $np := 6$ |
| Number of Negative Tension Bars | $nn := 6$ |
| Number of floors above beam | $nf := 1$ |
| Column Depth | $hc := 10 \cdot in$ |
| Column Width | $bc := 48 \cdot in$ |
| Column Length (removed at 1st floor) | $Lc := 12.5 \cdot ft$ |
| Existing Edge Beam Width | $w_e := 6 \cdot in$ |
| Existing Edge Beam Height | $h_e := 27 \cdot in$ |
| Slab Tributary Length | $s1 := 20 \cdot ft$ |
| Slab Tributary Width | $s2 := 5.83 \cdot ft$ |
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live load | $LLf := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Girder Depth | $hg := 10 \cdot in$ |
| Roof Girder Width | $wg := 10 \cdot in$ |
| Parapet Height | $hp := 4.7 \cdot ft$ |
| Parapet Width | $wp := 6 \cdot in$ |

| | |
|---|---|
| Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| | $Ec = 3 \times 10^{6}\, psi$ |
| Shear Reinforcement Dia. | $dv := 0.375 \cdot in$ |




MATERIAL STRENGTHS

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | (DoD Interim ATFP Construction Standards - Guidance on Structural Requirements, 3/5/01) |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 66000\, lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 3300\, lb \cdot in^{-2}$ |

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Point load at midspan of beam

| | |
|---|---|
| Weight of column at 3rd floor: | $Wcol = 6250\,lb$ |
| Weight of Roof wall | $Wwall = 7050\,lb$ |
| Weight of Roof | $Wroof = 2332\,lb$ |
| Roof Girders | $Wrgird = 2691\,lb$ |
| Weight Dead Load | $Wdl = 820\,\frac{lb}{ft}$ |
| Weight Roof Live Load | $Wll_r = 1166\,lb$ |
| Sum ofl Point Loads | $Psum = 19489\,lb$ |
| Impact Factor | |
| Total Point Load | $Ptot = 38977\,lb$ |

Distributed load along span of beam

| | |
|---|---|
| Weight of Slab at 3rd floor: | $Wslab = 291\,\frac{lb}{ft}$ |
| Weight of 3rd floor edge beam | $Wedge2 = 169\,\frac{lb}{ft}$ |
| Self Weight of Beam | $Wself = 359\,\frac{lb}{ft}$ |
| Weight Dead Load | $Wdl = 820\,\frac{lb}{ft}$ |
| Weight Live Load on 3rd floor | $Wll_{f2} = 292\,\frac{lb}{ft}$ |
| Sum of Distributed Load | $Wsum = 1111\,\frac{lb}{ft}$ |
| Impact Factor | |
| Total Distributed Load | $Wtot = 2222\,\frac{lb}{ft}$ |

AVERAGE MOMENT OF INERTIA

| | |
|---|---|
| Area of Tension Steel Bar | $Ab = 0.785\,in^2$ |
| Effective Depths | $yt = 2.88\,in$ |
| | $d = 20.1\,in$ |
| | $de = 17.3\,in$ |

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Beam Moment Capacity

AT MIDSPAN:

Area of PositiveTension Steel $As_{bot} = 4.712\,in^2$

Ultimate Moment Capacity at Midspan $Mu_m = 447088\,lb\,ft$

Midspan Moment due to Point Load $M_p = 175398\,lb\,ft$

Midspan Moment due to Distributed Load $M_w = 240003\,lb\,ft$

Total Midspan Moment demand $Mtot = 415401\,lb\,ft$

$Mtot < Mu_m$ OK

AT SUPPORTS:

Tension Steel Area

Ultimate Moment Capacity at Ends $Mu_s = 447088\,lb\,ft$

End Moment due to Point Load $M_p = 175398\,lb\,ft$

End Moment due to Distributed Load $M_w = 240003\,lb\,ft$

Total End Moment demand $Mtot = 415401\,lb\,ft$

$Mtot < Mu_s$ OK

Beam Shear Check

Concrete Shear Capacity $Vc = 34683\,lb$

Shear Reinf. Area (3/8"dia) $Av := 0.11 \cdot in^2$

Shear Reinf. Spacing $sv := 12 \cdot in$

Number of Legs $nv := 2$

Steel Shear Capacity $Vs = 24351\,lb$

Total Shear Capacity $Vn = 5.9 \times 10^4\,lb$

Shear due to Point load $V_p = 10234\,lb$

Shear due to Distributed load $V_d = 40000\,lb$

Total Shear Demand $V_{tot} = 50234\,lb$ $V_{tot} < V_n$ OK

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Ductility and Rotation

| | | | |
|---|---|---|---|
| Gross Mom. of Inertia | $Ig = 15209\,in^4$ | | |
| Elastic Stiffness | $Ke = 1 \times 10^6 \frac{lb}{ft}$ | | |
| Ultimate Resistance | $Ru = 99353\,lb$ | | |
| Steel Percentage | $\rho = 0.016$ | | |
| Modular Ratio | $n = 9$ | | |
| Neutral Axis of Transformed Section | $kd = 7\,in$ | | |
| Cracked Mom. of Inertia | $Ic = 9909\,in^4$ | | |
| Avg. Mom. of Inertia | $Ia = 12559\,in^4$ | | |
| Totat Force | $P = 59489\,lb$ | | |
| Equivalent Ductiltiy | $\mu = 1.25$ | | |
| Elastic Limit Displacement | $Xe = 0.88\,in$ | | |
| Peak Displacement | $Xm = 1.09\,in$ | | |
| Support rotation | $\phi = 0.29\,deg$ | <6 deg OK | (per DoD Interim ATFP Construction Standards, Guidance on structual requirements, 3/5/01) |

San Francisco, California 94103

Schofiled Barracks
Building 355 - Progressive Collapse
6" Deep Beam at 2nd floor - High roof area
(25' length of exterior wall removed at 1st floor)

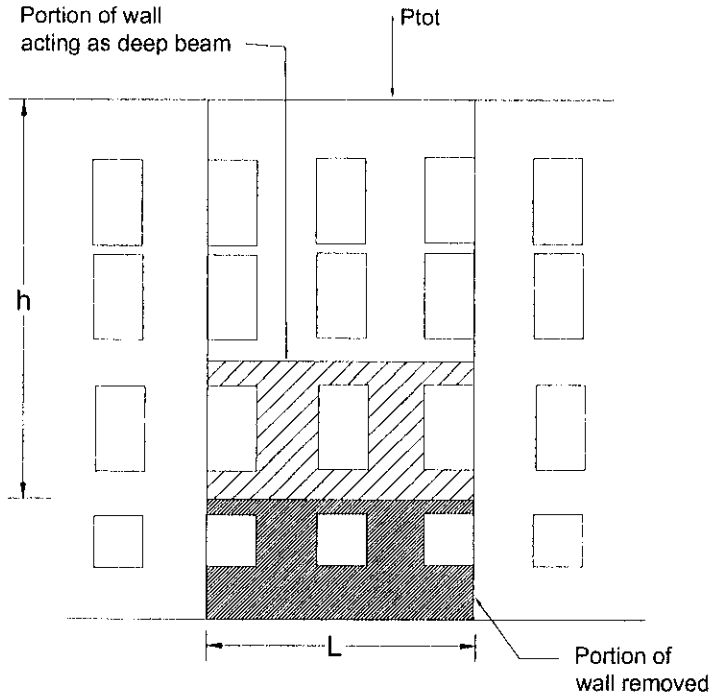
VC

$psi := lb \cdot in^{-2}$ $psf := lb \cdot ft^{-2}$

| | | | |
|---|---|---|---|
| Beam Length (wo col) | $L := 25 \cdot ft$ | Concrete Comp. Strength | $fc := 3000 \cdot psi$ |
| Beam Depth (total) | $h := 12.1 \cdot ft$ | Steel Yield Strength | $fy := 60000 \cdot psi$ |
| Beam Width | $b := 6 \cdot in$ | Steel Elastic Modulus | $Es := 29000000 \cdot psi$ |
| Cover Depth | $c := 2 \cdot in$ | Reinf. Concrete Wt. Density | $\gamma c := 150 \cdot lb \cdot ft^{-3}$ |
| Slab Thickness | $t := 6 \cdot in$ | | |
| Tension Rebar Diameter | $db := 0.75 \cdot in$ | Conc. Elastic Modulus | $Ec := 57000 \cdot \sqrt{fc \cdot lb \cdot in^{-2}}$ |
| Tension Rebar Spacing | $ds := 6 \cdot in$ | | $Ec = 3 \times 10^{6} psi$ |

Number of Tension/compression Bars $np := 2$

| | |
|---|---|
| Roof Dead Load | $DLr := 20 \cdot psf$ |
| Floor Live Load | $LL := 100 \cdot psf$ |
| Roof Live Load | $LLr := 20 \cdot psf$ |
| Roof Tributary Width | $r1 := 20 \cdot ft$ |
| Roof Tributary Length | $r2 := 30.42 \cdot ft$ |
| Slab Tributary Width | $s1 := 20 \cdot ft$ |
| Slab Tributary Length | $s2 := 8.42 \cdot ft$ |
| Number of Floors Above | $n_f := 2$ |
| 3rd floor ext. wall thickness | $t_3 := 6 \cdot in$ |
| 2nd floor ext. wall thickness | $t_2 := 8 \cdot in$ |




MATERIAL STRENGTHS

(D
Standards - Guidance on
Structural Requirements, 3/5/01)

| | | |
|---|---|---|
| Steel Increase Factor | $IFs := 1.1$ | |
| Concrete Increase Factor | $IFc := 1.1$ | |
| Steel Yield Strength | $fdy := IFs \cdot fy$ | $fdy = 66000 lb \cdot in^{-2}$ |
| Concrete Comp. Strength | $fdc := IFc \cdot fc$ | $fdc = 3300 lb \cdot in^{-2}$ |

Point load on beam

Weight of Roof Load $Wdl = 3315 \frac{lb}{ft}$



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Weight Roof Live Load $Wll = 842 \frac{lb}{ft}$

Sum ofl Point Loads $Psum = 18252 lb$

Total Point Load $Ptot = 36504 lb$

Distributed load along span of beam

Weight of Slab at 3rd and 2nd floors: $Wslab = 1263 \frac{lb}{ft}$

Weight of 2nd and 3rd floor Exterior Walls $Wext = 1419 \frac{lb}{ft}$

(assume 1/3 of wall area is windows)

Weight of shotcrete wall $Wself = 633 \frac{lb}{ft}$

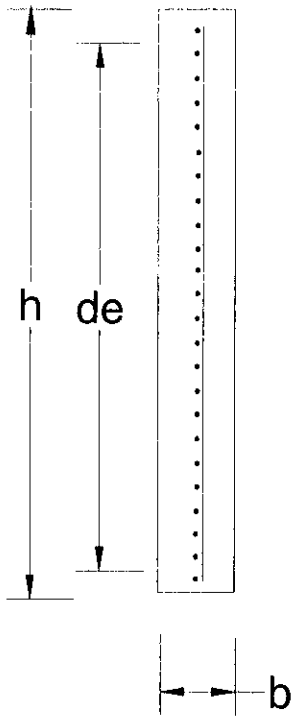
(assume 1/3 of wall area is windows)

Weight Dead Load $Wdl = 3315 \frac{lb}{ft}$

Weight of Live Load at 2nd and 3rd floors $Wll = 842 \frac{lb}{ft}$

Sum of Distributed Load $Wsum = 4157 \frac{lb}{ft}$

Total Distributed Load $Wtot = 8314 \frac{lb}{ft}$




Cross section of shotcrete wall

AVERAGE MOMENT OF INERTIA

Area of Tension Steel Bar $Ab = 0.442 in^2$

Area of Tension Steel $As = 0.884 in^2$

(assume only the 2 most top and bottom bars serve as tension or compression steel.)

Effective Depths $yt = 2.38 in$

$d = 140.5 in$

$de = 134.5 in$



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Beam Moment Check

Ultimate Moment Capacity $Mu = 653380\,lb\,ft$

Midspan Moment due to Point Load $M_{pm} = 80491\,lb\,ft$

Midspan Moment due to Distributed Load $M_{wm} = 216504\,lb\,ft$

Total Moment Demand $M_{tot} = 567160\,lb\,ft$

$M_{tot} < Mu$ OK

End Moment due to Point Load $M_{pe} = 134152\,lb\,ft$

End Moment due to Distributed Load $M_{we} = 433008\,lb\,ft$

Total Moment Demand $M_{tot} = 567160\,lb\,ft$

$M_{tot} < Mu$ OK

Beam Shear Check

Depth of beam for shear $d_v = 5.6\,ft$

Concrete Shear Capacity $Vc = 46324\,lb$

Shear Reinf. Area (3/4"dia) $Av := 0.44 \cdot in^2$

Shear Reinf. Spacing $sv := 6 \cdot in$

Number of Legs $nv := 1$

Steel Shear Capacity $Vs = 325248\,lb$

Total Shear Capacity $Vn = 3.72 \times 10^5\,lb$

Shear due to Point load $V_p = 28619\,lb$

Shear due to Distributed load $V_d = 103922\,lb$

Total Shear Demand $V_{tot} = 132541\,lb$ $V_{tot} < V_c$ OK



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Ductility and Rotation

| | | | |
|---|---|---|---|
| Gross Mom. of Inertia | $Ig = 2 \times 10^6 in^4$ | | |
| Elastic Stiffness | $Ke = 4.08 \times 10^8 \frac{lb}{ft}$ | | |
| Moment Capacity at Midspan | $Mu_m = 653380 lb\,ft$ | | |
| Moment Capacity at Supports | $Mu_s = 653380 lb\,ft$ | | |
| Ultimate Resistance | $Ru = 209082 lb$ | | |
| Neutral Axis of Transformed Section | $kd = 17 in$ | | |
| Cracked Mom. of Inertia | $Ic = 136459 in^4$ | | |
| Avg. Mom. of Inertia | $Ia = 833544 in^4$ | | |
| Totat Force | $P = 122174 lb$ | | |
| Equivalent Ductiltiy | $\mu = 1.2$ | | |
| Elastic Limit Displacement | $Xe = 0.0062 in$ | | |
| Peak Displacement | $Xm = 0.0074 in$ | | |
| Support rotation | $\phi = 0.0028 deg$ | <6 deg OK | (per DoD Interim ATFP Construction Standards, Guidance on structual requirements, 3/5/01) |

| Bldg | Side | Glass thickness | Layup | Standoff (ft) | Angle | Window Size (HxW) | Bite | Result |
|---|---|---|---|---|---|---|---|---|
| 355 | street | 3/8", 1/2" air, 3/8" | lam therm temp | 25.4 | Reflective | 54x60 | 0.625 | OK2 |
| 355 | quad | 1/4" | lam annealed | 86.9 | Incident | 120x60 | 0.625 | OK2 |
| 356 | street | 1/2", 1/2" air, 1/2" | lam therm temp | 13.4 | Reflective | 54x60 | 0.625 | OK2 |
| 356 | quad | 1/4" | lam annealed | 102.6 | Incident | 120x60 | 0.625 | OK2 |
| 357 | street | 3/8", 1/2" air, 3/8" | lam therm temp | 23.2 | Reflective | 54x60 | 0.625 | OK2 |
| 357 | quad | 1/4" | lam annealed | 89.3 | Incident | 120x60 | 0.625 | OK2 |
| 358 | street | 1/4", 1/2" air, 1/4" | lam therm temp | 35.8 | Reflective | 54x60 | 0.625 | OK3b |
| 358 | quad | 1/4" | lam annealed | 99.3 | Incident | 120x60 | 0.625 | OK3b |

Notes: 1. Army Corps of Engineers' seismic retrofit calls for double pane glass for all windows facing the adjacent through street. Assume short sides of building also count as "facing the street".

# Window Summary

| Retrofit Item | Building 355 | | Building 356 | | Building 357 | | Building 358 | |
|---|---|---|---|---|---|---|---|---|
| Exterior Walls | 8" shotcrete (1st)<br>6" shotcrete (2nd, 3rd) | not quad side | 10" shotcrete (1st)<br>8" shotcrete (2nd)<br>6" shotcrete (3rd) | not quad side | 8" shotcrete (1st)<br>6" shotcrete (2nd, 3rd) | not quad side | 6" shotcrete (all floors) | not quad side |
| Exterior Beams | 15"x23" beam doweled to existing floor beams L | 2nd floor<br>3rd floor | 15"x23" beam doweled to existing floor beams L | 2nd floor<br>3rd floor | 15"x23" beam doweled to existing floor beams L | 2nd floor<br>3rd floor | 15"x23" beam doweled to existing floor beams L | 2nd floor<br>3rd floor |
| Exterior Slabs | fibreWrap | top | fibreWrap | top | fibreWrap | top | fibreWrap | top |
| Breezeway Walls | 8" shotcrete | <50' | N/A | | N/A | | N/A | |
| Breezeway Beams | fibreWrap | top | N/A | | N/A | | N/A | |
| Breezeway Columns | OK | | N/A | | N/A | | N/A | |
| Exterior Columns | OK | | OK | | OK | | OK | |
| Interior Beams<br>(H only, others OK) | fibreWrap<br>shear plate | top | fibreWrap<br>shear plate | top | fibreWrap<br>shear plate | top | fibreWrap<br>shear plate | top |
| Interior Slabs | fibreWrap | top | fibreWrap | top | fibreWrap | top | fibreWrap | top |
| Interior Columns | OK | | OK | | OK | | OK | |
| Steel Roof System | W2 Formlock 18 Ga Deck<br>N Formlock 18 Ga Deck | if span is 6'<br>if span is 8' | W10x45<br>W12x79<br>N Formlock 18 Ga Deck | deck span is 8' | W10x45<br>W12x79<br>N Formlock 18 Ga Deck | deck span is 8' | W10x45<br>W12x79<br>N Formlock 18 Ga Deck | deck span is 8' |
| Windows | 3/8", 1/2" air, 3/8" lam TT<br>1/4" lam Annealed | street<br>quad | 1/2", 1/2" air, 1/2" lam TT<br>1/4" lam Annealed | street<br>quad | 3/8", 1/2" air, 3/8" lam TT<br>1/4" lam Annealed | street<br>quad | 1/4", 1/2" air, 1/4" lam TT<br>1/4" lam Annealed | street<br>quad |

# Retrofit Summary

ATTACHMENT 10

# SEISMIC EVALUATION AND REHABILITATION REPORT

# *SEISMIC EVALUATION and REHABILITATION REPORT*

WHOLE BARRACKS RENEWAL
BRIGADE COMPLEX, PHASE 3A, QUAD C
FY03 MCA PN52068 & BUP 52069
SCHOFIELD BARRACKS, OAHU, HAWAII

## *VOLUME TWO*

February 2003

PREPARED FOR:

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Honolulu
Engineering Services Branch
Engineering and Construction Division
Fort Shafter, Hawaii 96858-5440

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2.3 Material Properties and Evaluation Criteria

## 3.0 FINDINGS AND RECOMMENDATIONS

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3.3 Seismic Retrofit Recommendations
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3.33 Added Transverse Walls
3.34 Concrete Frames at 3rd Floor
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## APPENDIX A: TIER 2 EVALUATION

## APPENDIX B: SEISMIC RETROFIT CALCULATIONS

# 1.0 INTRODUCTION

This report addresses seismic evaluation and rehabilitation issues for the Quad "C" buildings at Schofield Barracks, Oahu, Hawaii in accordance with the task order scope of work for **"FY03 MCA and BUP PN52069, Whole Barracks Renewal Brigade Complex, Phase 3A, Quad C, Schofield Barracks, Oahu, Hawaii** (Concept Design for Design-Build RFP package)". The site and buildings are described in Section 2. Section 3 summarizes the seismic evaluation findings and the proposed retrofit and includes building layouts incorporating the retrofit recommendations.

## 1.1 Background

The U.S. Army Corps of Engineers issued a Request For Proposal (RFP) for renovations to Quad "C" at Schofield Barracks, Hawaii. As stated in the RFP, contractors were to design and lay out Quad "C" renovations, which incorporated requirements to meet seismic and antiterrorism/ force protection (AT/FP) criteria and historical preservation requirements. AT/FP issues were addressed by Hinman Consulting Engineers, Inc. and are included in a separate report.

This report proposes a retrofit strategy designed to meet the above criteria and is a concept design only (for the design-build package). The Design Build contractor shall be responsible for providing the final design and retrofit for Quad "C" — subject to the requirements in the RFP package.

## 1.2 References

The following references were used in the preparation of this report:

- *TI 809-04, Seismic Design for Buildings*, dated 31 Dec 1998;
- *TI 809-05, Seismic Evaluation and Rehabilitation for Buildings*, dated Nov 1999;
- *FEMA 273, NEHRP Guidelines for the Seismic Rehabilitation of Buildings*, dated Oct 1997;
- *FEMA 302, NEHRP Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*, dated Feb 1998;
- *FEMA 310, Handbook for the Evaluation of Buildings — A Prestandard*, dated Jan 1998;

- *ACI 318-95, Building Code Requirements for Structural Concrete and Commentary*, dated Feb 1996;
- Excerpts from the original design drawings dated 1917. Drawings reviewed were primarily for Building 355;
- Drawings for the Modernization of Barracks Quads C & J and Medics Area dated 1973;
- Corps of Engineers architectural plans for FY03 MCA and BUP PN52069 dated 31 Oct 2002;
- *Seismic Evaluation & Anti-Terrorism/Force Protection Study for Whole Barracks Renewal, Phase 4A, Renovations of Quad "F", Schofield Barracks, Hawaii*, by SSFM International, Inc., dated 20 Aug 2001;
- *Air-Blast and Progressive Collapse Vulnerability Assessment, Buildings 355, 356, 357, and 358, Schofield Barracks, Oahu, Hawaii, Draft Report*, by Hinman Consulting Engineers, Inc. dated 22 Jan 2003.

## 1.3 Scope of Work

Based on the above references and the task order indicated, Mitsunaga and Associates, Inc. performed the following tasks for this report:

- Reviewed available existing drawings and concept plans for the Quad "C" renovations;
- Reviewed seismic studies for similar adjacent buildings (Quad "F");
- Reviewed AT/FP recommendations for Quad"C" and similar adjacent buildings (Quad "F");
- Performed a general visual inspection on the condition of the existing buildings;
- Performed a full building evaluation (Tier 2 analysis) on one building in Quad "C" to identify structural deficiencies in the existing lateral load-resisting system; and
- Developed conceptual level retrofit schemes to bring the building into compliance with the above-referenced codes, standards, renovation concept plans, and AT/FP criteria.

### 1.4 Limitations and Exclusions

- Detailed design was not included in the scope of this work and is to be performed by the Design/Build contractor in consultation with a qualified, licensed structural engineer;
- Retrofit recommendations incorporated the renovation concept plans and AT/FP criteria for Quad "C" that were available at the time of this report and on material testing for similar adjacent buildings (Quad "F");
- Analysis of the existing structure for other than seismic loads was outside the scope of work for this report;
- Cost estimating was not included in the scope of work for this report; and
- This report does not address any other portions of the structure or property other than those areas mentioned, nor does it accord warranty, either expressed or implied, for any portion of the existing structures.

## 2.0 SITE AND BUILDING DESCRIPTION

This section describes the site layout and building descriptions.

### 2.1 Building Location and Layout

Quad C is a block of four multi-use buildings (355, 356, 357, and 358) within the Schofield Barracks installation on the island of Oahu, Hawaii. The buildings are arranged in a square pattern around an interior courtyard and are bounded by streets on three sides and an open parking lot on the fourth side. Access roads at the corners of the block lead to the interior courtyard.

Buildings 355, 356, 357, and 358 are three-story rectangular structures approximately 364 feet long by 61 feet wide by 42 feet high. Two "bump outs" are located on the courtyard side of Buildings 356, 357, and 358 at the one third points of the building. Building 355 houses a gymnasium on the 3rd floor. All buildings have exterior corridors and stairs facing the courtyard.

### 2.2 Building Construction

The buildings are reinforced concrete structures with a "mixed" framing system: concrete floor slabs are supported by concrete bearing walls along the exterior of the building and by concrete

frames along the interior, all running in the longitudinal direction. The columns and walls are supported on spread footings. The suspended floors are conventionally reinforced concrete slabs, 6 inches thick at the interior floors and 4 inches thick concrete at the exterior corridors. Two-inch thick concrete walls run transversely at the quarter points of the buildings.

The existing roof typically consists of 2x wood decking supported on 2x8 rafters spaced at 16 inches on center on wood trusses running over the interior columns. A grid of concrete beams below the trusses provides some stability to the roof structure and the exterior walls. The roof over the gymnasium in Building 355 was constructed more recently and consists of metal decking supported on structural steel trusses spaced at 10 feet on center and spanning transversely between the exterior walls.

For a detailed evaluation of the lateral load-resisting system, see Section 3.

## 2.3 Material Properties and Evaluation Criteria

Based on the Seismic Evaluation & Anti-Terrorism/Force Protection Study for Quad "F", the following material properties were used for the existing structure:

Reinforcing Steel Strength: fy = 40,000 psi
Concrete Strength: f'c = 2,500 psi

For new construction, and construction in conjunction with the existing structure (such as new shotcrete applied to existing walls), the following conservative material properties were used:

Reinforcing Steel Strength: fy = 60,000 psi (no contribution from existing reinforcing)
Concrete Strength: f'c = 3,000 psi

Also, based on the Quad "F" study, the following seismic parameters were used:

Short Period Spectral Response Acceleration Parameter, Ss = 0.60
Spectral Response Acceleration Parameter at 1 Second, S1 = 0.17

Seismic Use Group II
Performance Level: Immediate Occupancy (IO)
Site Class E

# 3.0 FINDINGS AND RECOMMENDATIONS

This section presents the findings on the evaluation of the existing Quad "C" buildings and the proposed seismic retrofit strategy.

## 3.1 Description of the Existing Lateral System

The primary lateral load-resisting elements for the existing structures are the exterior concrete shear walls located on all four sides of each building. Concrete frames running in the longitudinal direction at all levels offer minimal lateral resistance when compared to the walls (see rigidity calculations in Appendix A) and are therefore excluded from the lateral load-resisting system. Except for the side walls, the only structural elements having significant lateral resistance in the transverse direction are the 2-inch thick concrete partition walls typically located at the quarter points of each building. These walls are included in the system in order to limit the span-to-depth ratio of the floor diaphragms in the transverse direction.

Based on the existing drawings, the exterior walls are 8 inches thick at the ground and 2$^{nd}$ floors, and 6 inches thick at the 3$^{rd}$ floor. No.3 bars spaced at 24 inches on center are shown on each side and on each face of the walls on the ground and 2$^{nd}$ floors. On the 3$^{rd}$ floor, a 6-inch by 6-inch No.6 wire mesh is shown at the center of the wall.

Non-destructive testing did not detect reinforcing around the wall openings for Quad "F". The lateral capacity of the shear walls for Quad "C" may, therefore, be limited by the flexural capacity of the wall piers rather than by the shear capacity of the wall (since vertical reinforcing may not be present at the ends of the piers).

At the roof level, where the flexible wood diaphragm limits the allowable span between load-resisting elements, the concrete frames, spaced approximately 20 feet on center, must be used as part of the lateral system. Calculations on the capacity of the wood diaphragm are included in Appendix A. However, it does not appear from the existing drawings that adequate bracing is present to transfer loads from the roof diaphragm to the concrete frames.

## 3.2 Seismic Screening: Tier 2 Evaluation

According to FEMA Table 3-3, concrete frames with having a flexible diaphragm (at the roof), in a "High" region of seismicity and at a performance level designated as "Immediate Occupancy", cannot be evaluated by a Tier 1 checklist evaluation. A Tier 2 "full building" evaluation was, therefore, performed in accordance with TI 809-05 and FEMA 310 using the Linear Static Procedure. The Tier 2 evaluation is presented in Appendix A.

Based on the results of the Tier 2 evaluation, the following structural deficiencies were identified:

- The shear capacity of the wood roof diaphragm was exceeded;
- The shear and flexural capacities of the concrete frame beams and columns at the 3rd floor were exceeded; and
- The shear and flexural capacities of the exterior concrete shear walls were exceeded.

## 3.3 Seismic Retrofit Recommendations

The following seismic rehabilitation strategy proposes to eliminate the structural deficiencies identified in the Tier 2 evaluation while also incorporating AT/FP blast requirements for the exterior walls and the renovation concept plans and historical preservation criteria referenced. Documentation for the proposed rehabilitation is presented in Appendix B.

### *3.31 Roof System*

Replacement of the existing wood roof with a new metal deck roof and structural steel framing will provide sufficient diaphragm strength for the distribution of seismic forces to the transverse concrete frames below. The weight of the proposed roof system is comparable to the present system and will, therefore, not impose additional gravity and seismic loads to the supporting structure.

The roof system will also meet AT/FP blast requirements.

### *3.32 Exterior Walls*

The shear and flexural capacities of the exterior walls are improved by retrofitting with shotcrete applied to the interior surface of the wall. Positive connection to the existing structure is required for the entire wall to perform as designed. Additional wall reinforcing in the shotcrete increases the flexural capacity of the entire wall and its components.

Final wall thicknesses were selected to correspond with the AT/FP blast requirements. At the inner Quad walls (facing the courtyard), shotcrete was added primarily to improve the flexural performance of the wall and its components, by providing concrete cover for additional wall reinforcing. Retrofitted walls are presented in Figures 1 thru 12 at the end of this Section.

The exterior wall retrofit to the interior surfaces will also satisfy historical preservation criteria.

### *3.33 Added Transverse Walls*

Additional transverse concrete shear walls are required at the interior of the building to minimize seismic forces on the exterior walls and to reduce span-to-depth ratios of the floor diaphragms.

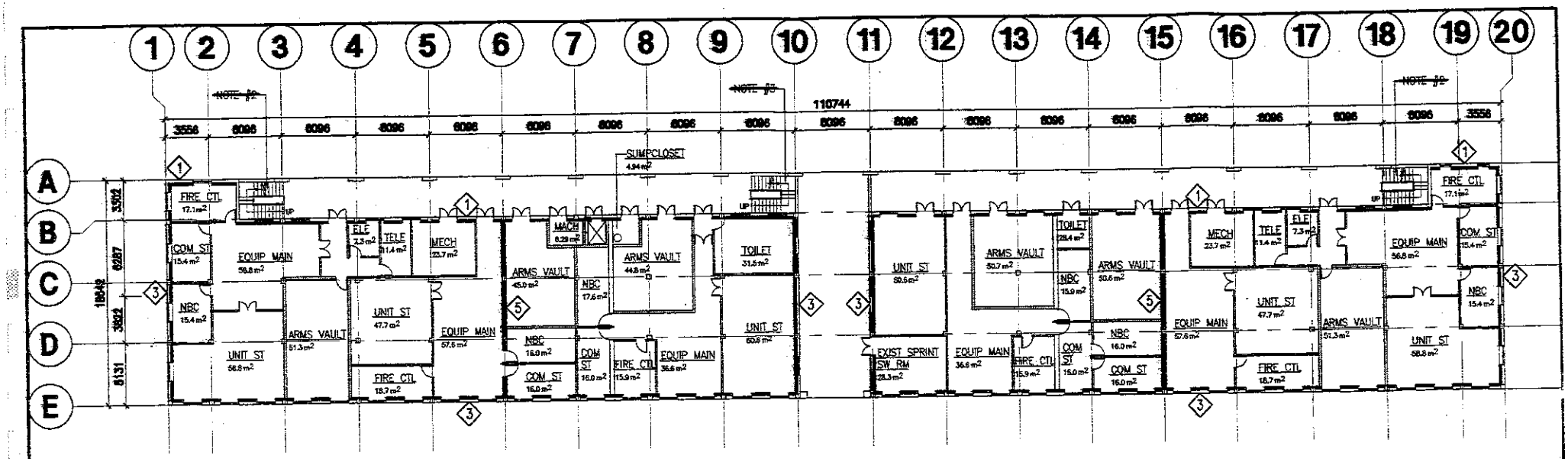
The added walls were aligned with the building grids and incorporated into the concept plans for the building renovations and are presented in Figures 1 thru 12 at the end of this Section.

### *3.34 Concrete Frames at the 3rd Floor*

Retrofitting one bay of each concrete transverse frame at the 3rd floor is required to transfer roof diaphragm forces to the supporting structure below. Additional interior shear walls at the 3rd floor were not considered, since the diaphragm capacity of the roof system would dictate a closer shear wall spacing than is practical.

## 3.4 Shear Wall Retrofit Figures (1-12)

The shear wall retrofit schemes for Buildings 355, 356, 357, and 358 are presented on the following Figures 1 thru 12.




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

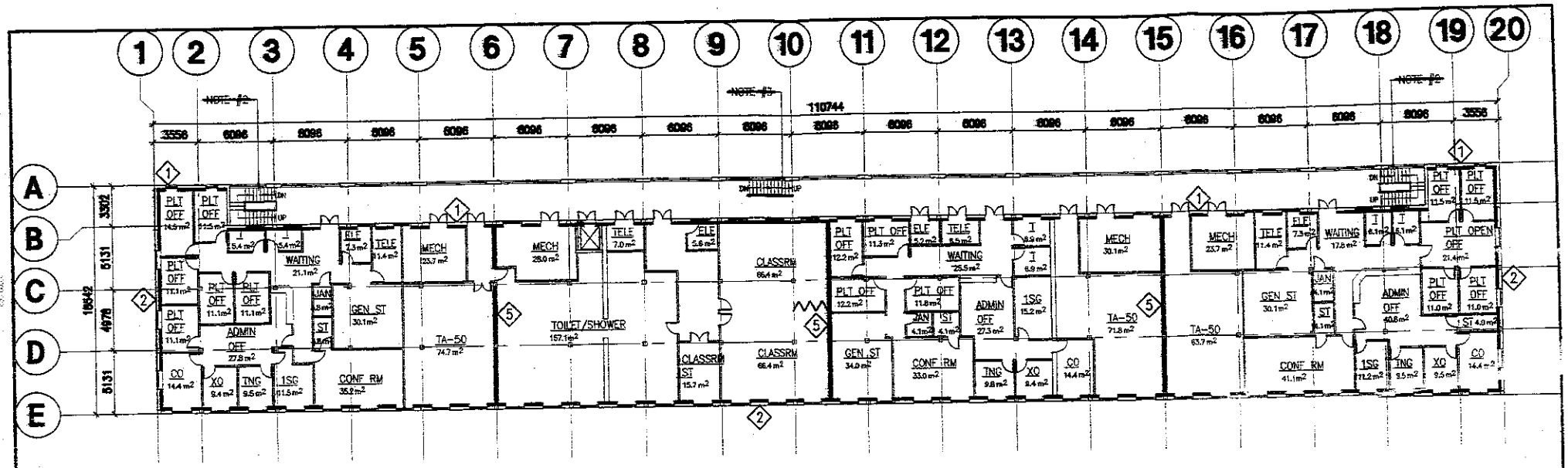
# BUILDING 355 - FIRST FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 1




## SHEARWALL RETROFIT SCHEDULE

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| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 355 - SECOND FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

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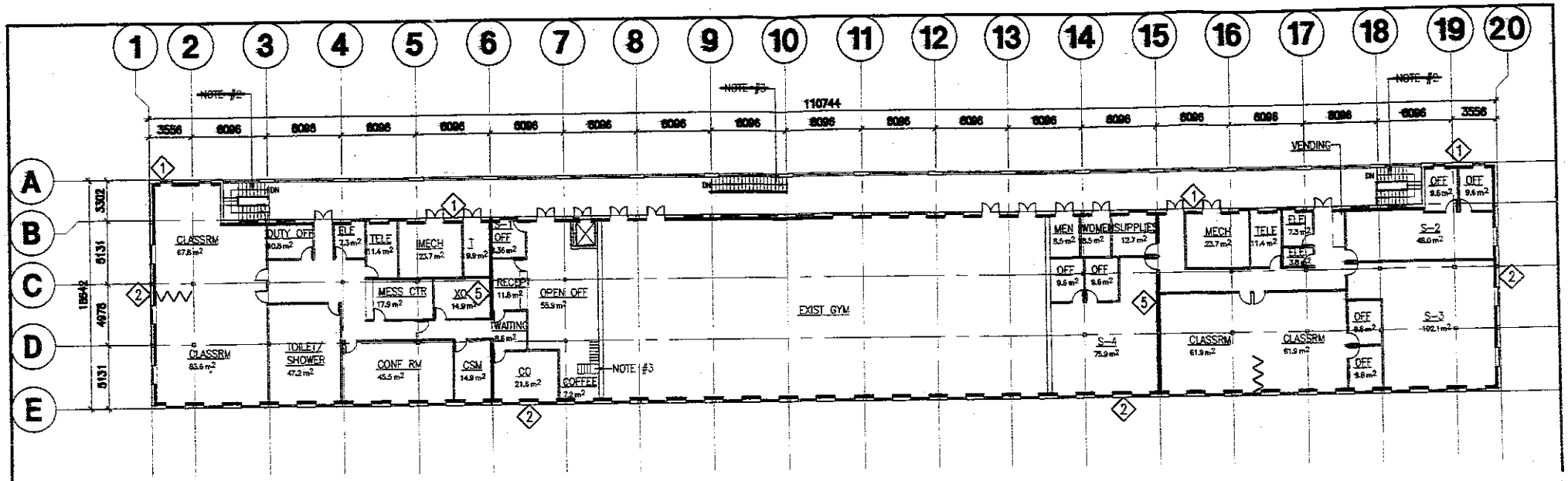
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 2




## SHEARWALL RETROFIT SCHEDULE

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| 1 | RETROFIT 4" SHOTCRETE WALL |
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| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 355 - THIRD FLOOR PLAN

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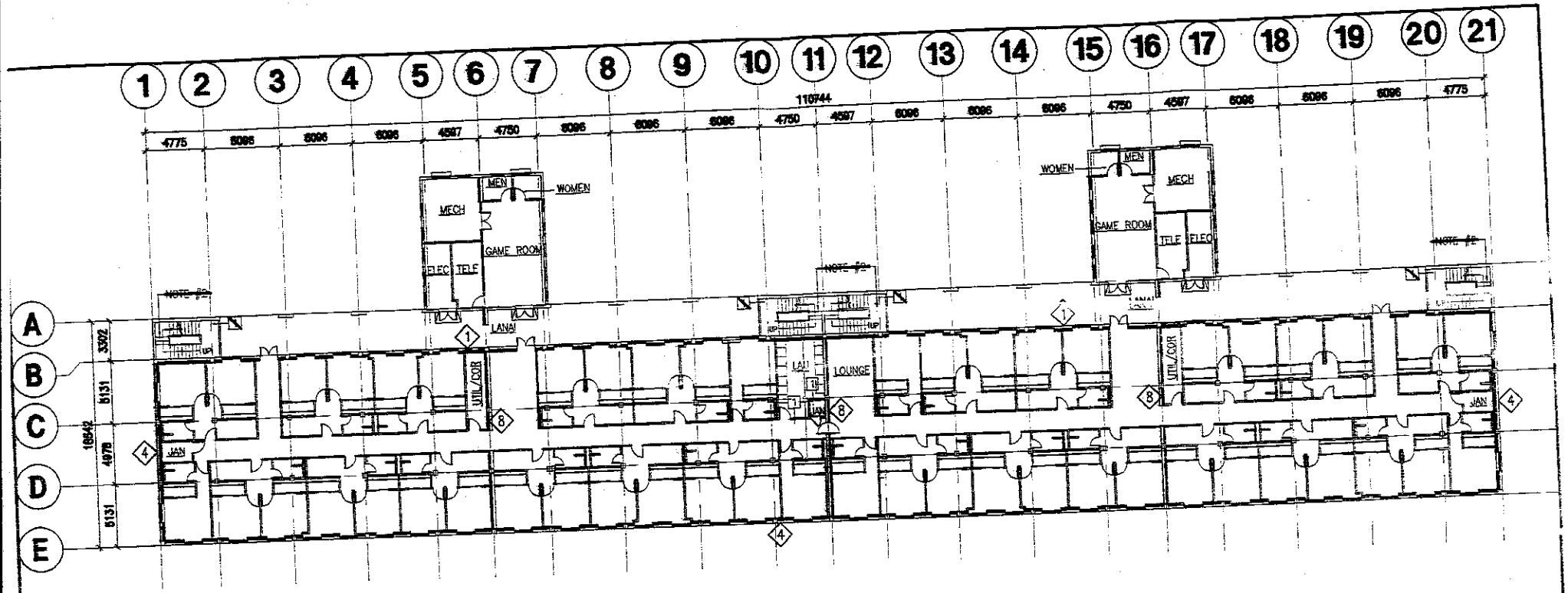
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 3




## BUILDING 356 - FIRST FLOOR PLAN

### SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
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SEISMIC EVALUATION and REHABILITATION REPORT
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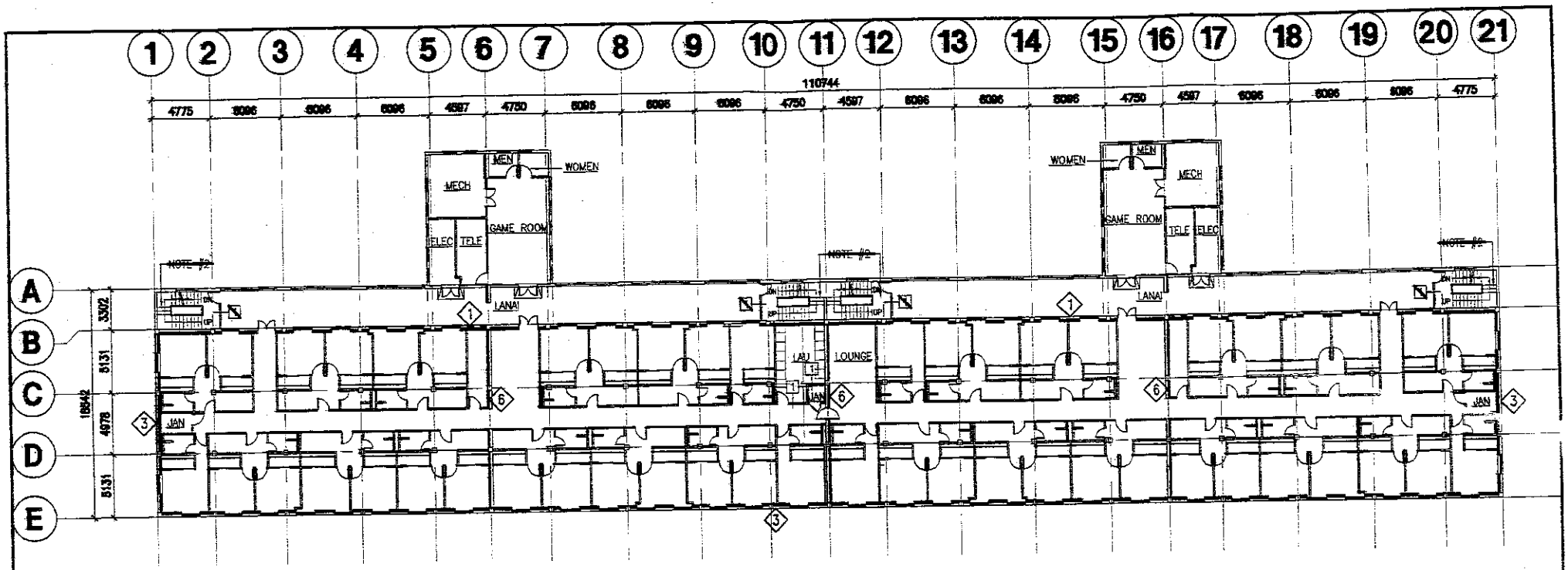
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 4




## BUILDING 356 - SECOND FLOOR PLAN

### SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
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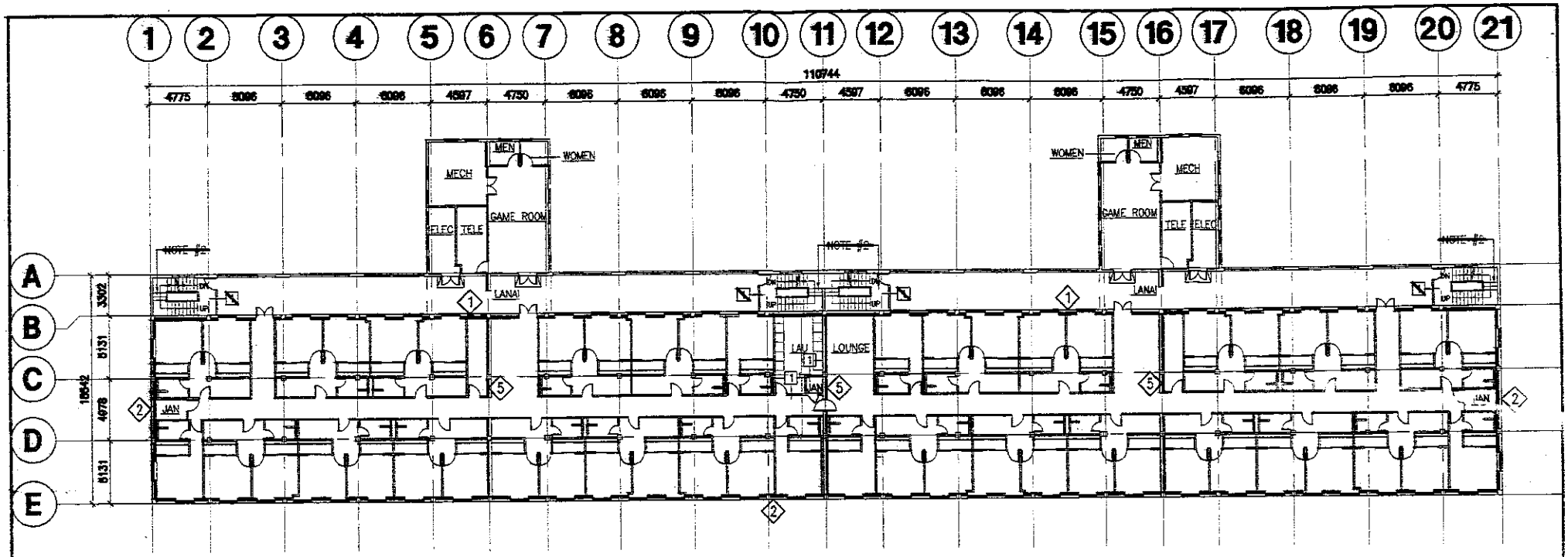
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 5

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## BUILDING 356 - THIRD FLOOR PLAN

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747 AMANA STREET, STE. 216
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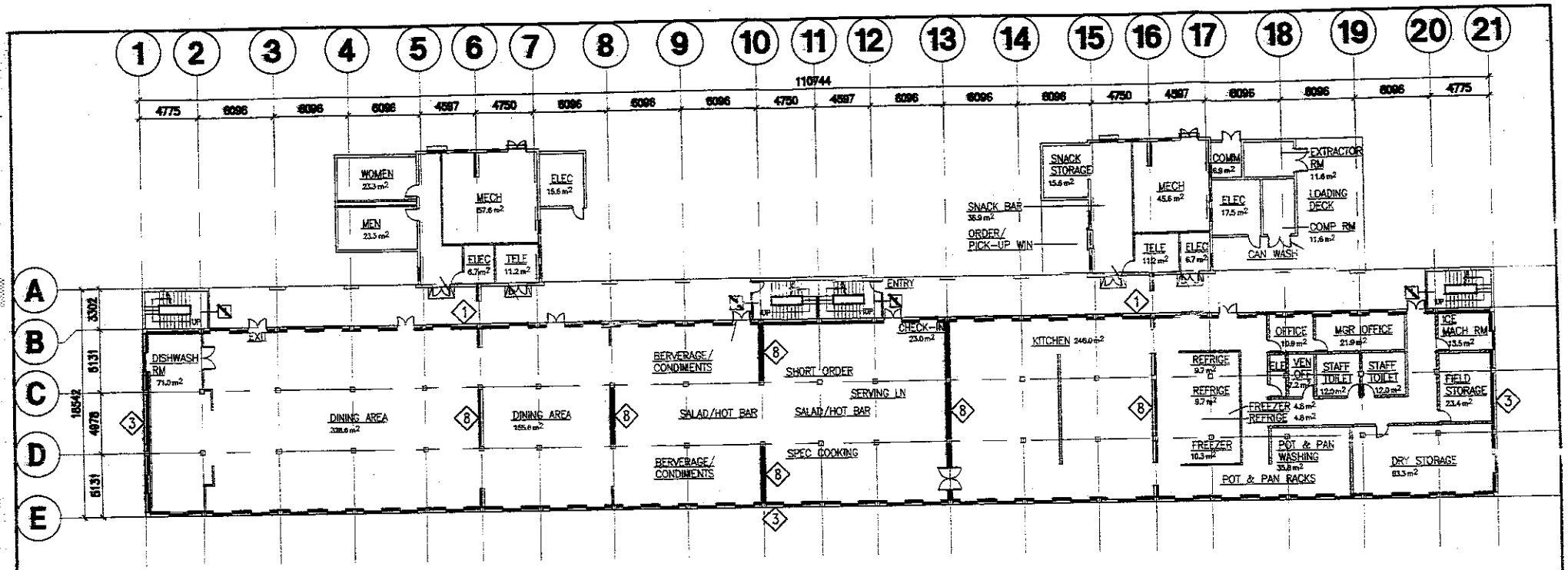
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 6




## BUILDING 357 - FIRST FLOOR PLAN

## SHEARWALL RETROFIT SCHEDULE

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|---|---|
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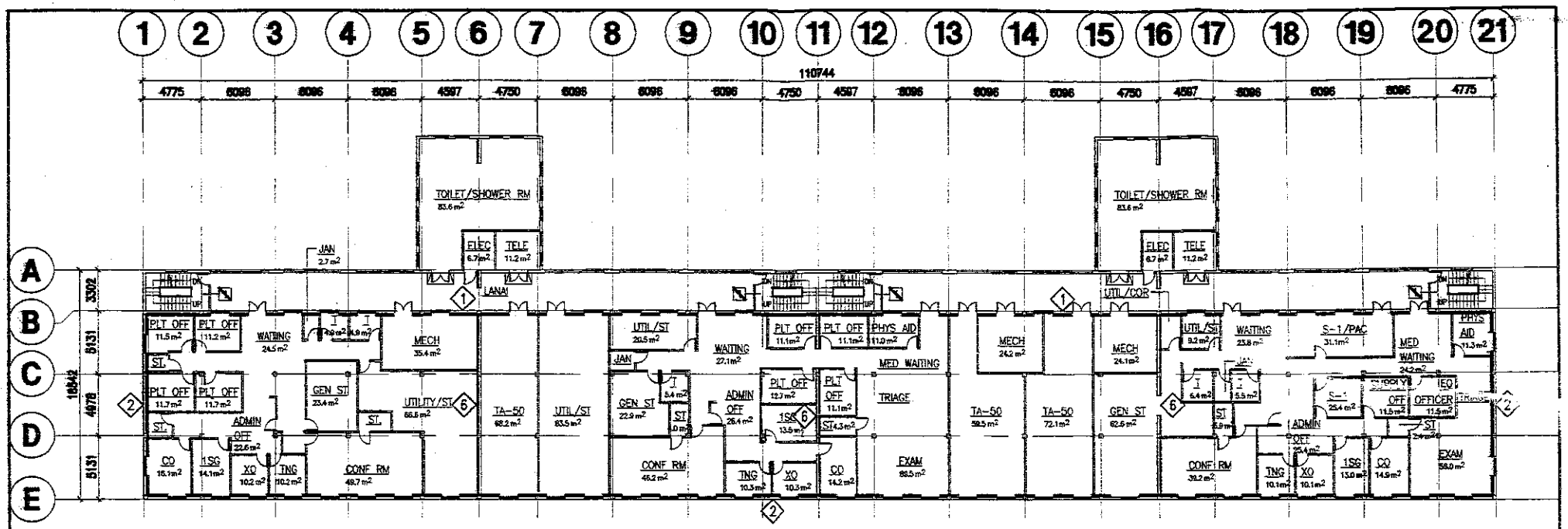
FIGURE 7

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# BUILDING 357 - SECOND FLOOR PLAN

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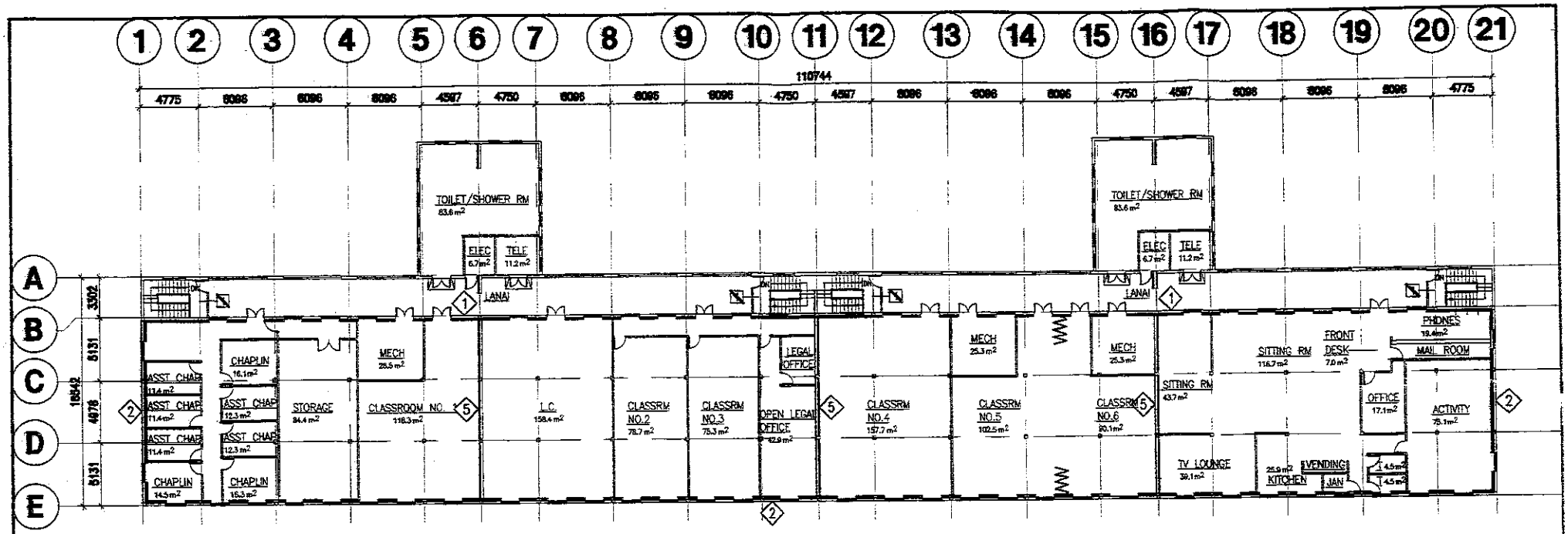
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 357, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 8

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# BUILDING 357 - THIRD FLOOR PLAN

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SEISMIC EVALUATION and REHABILITATION REPORT
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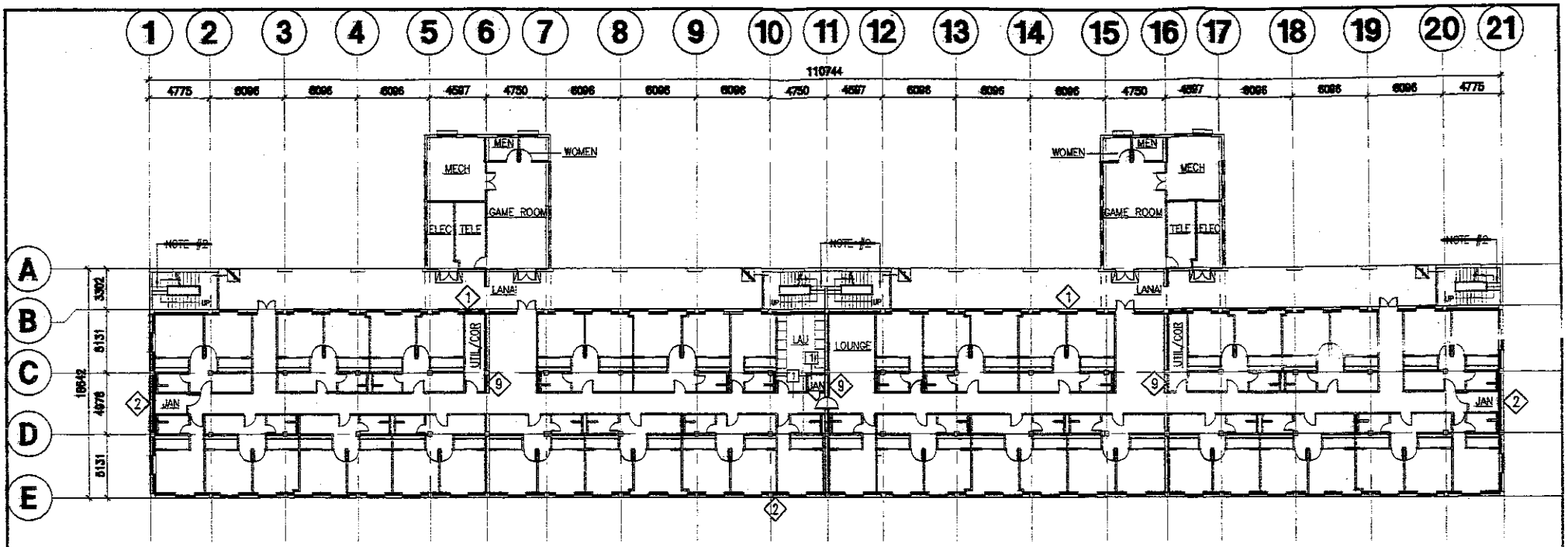
SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 9




## BUILDING 358 - FIRST FLOOR PLAN

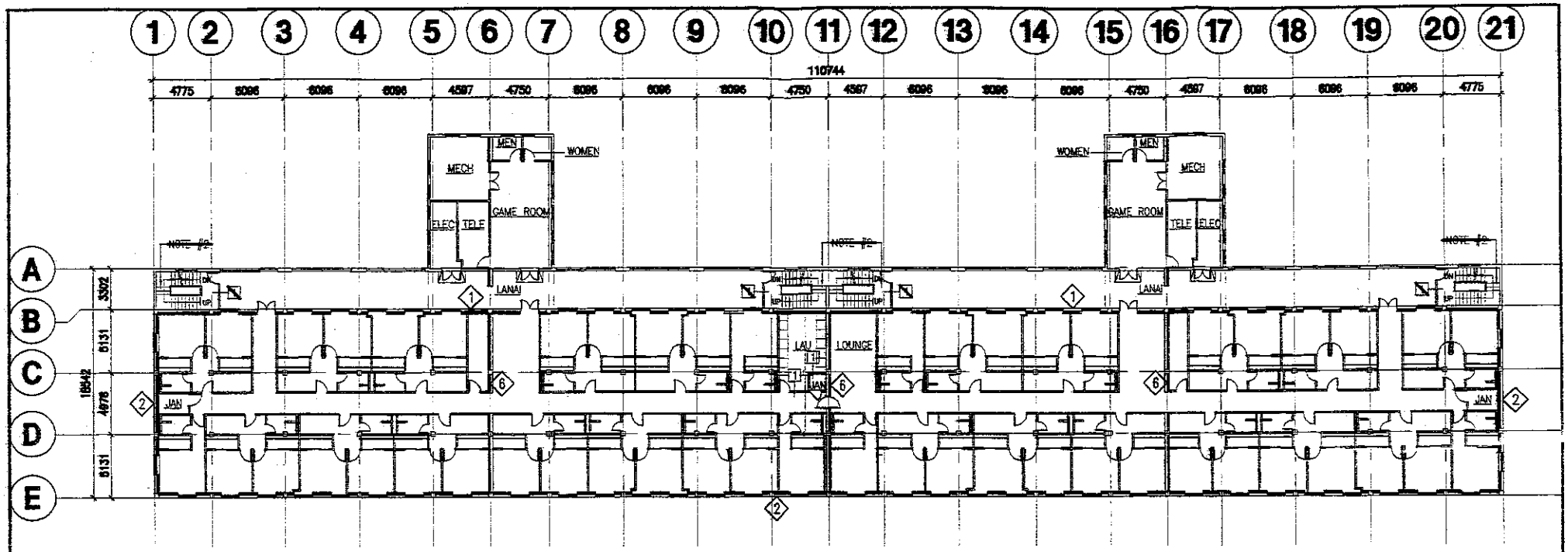
| SHEARWALL RETROFIT SCHEDULE | |
|---|---|
| DESIGNATION | DESCRIPTION |
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 10




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

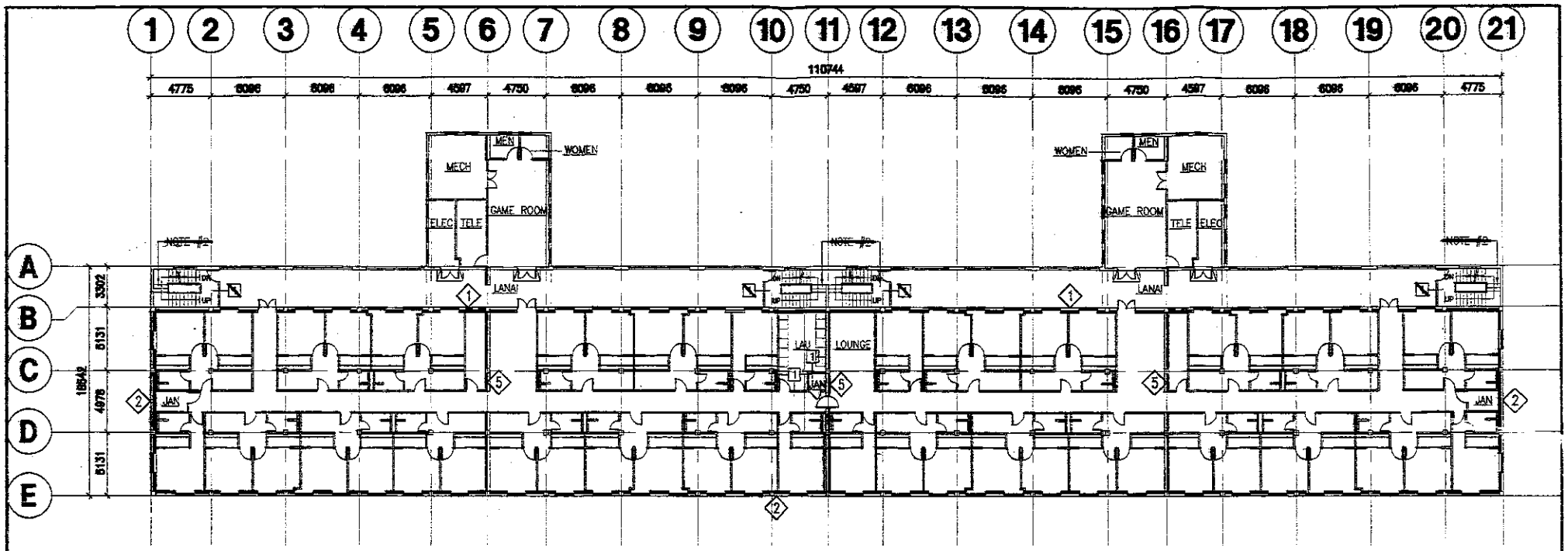
# BUILDING 358 - SECOND FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 11




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 358 - THIRD FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 12

# *SEISMIC EVALUATION and REHABILITATION REPORT*

## *APPENDIX A: TIER 2 EVALUATION*

WHOLE BARRACKS RENEWAL
BRIGADE COMPLEX, PHASE 3A, QUAD C
FY03 MCA PN52068 & BUP 52069
SCHOFIELD BARRACKS, OAHU, HAWAII

February 2003

PREPARED FOR:

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Honolulu
Engineering Services Branch
Engineering and Construction Division
Fort Shafter, Hawaii 96858-5440

PREPARED BY:

Mitsunaga and Associates, Inc.
747 Amana Street Suite 216
Honolulu, Hawaii 96814
Phone: (808) 945-7882 Fax: (808) 946-2563
Email: Mitsunaga003@hawaii.rr.com

FOR OFFICIAL USE ONLY

The Tier 2 evaluation includes the following:

- Dead and live load determination;
- Total building dead load and center of mass determination at each floor level;
- Seismic base shear and force distribution at each floor level;
- Roof diaphragm shear capacity check;
- Estimation of concrete frame rigidities and equivalent solid wall thicknesses;
- Rigidity calculations for shear walls with openings and equivalent solid wall thicknesses;
- Seismic shear distribution to walls based on rigid diaphragm analysis at each floor level and for the roof diaphragm in the longitudinal direction;
- Seismic shear distribution to walls and frames based on flexible diaphragm analysis for the roof diaphragm in the transverse direction; and
- Determination of shear and flexural capacities for walls and frames and comparison with the distributed seismic forces.

# ROOF DIAPHRAGM CHECK

SHEAR CAPACITY OF THE WOOD DECK ROOF IS A DEFORMATION-CONTROLLED ACTION:

FEMA Section 8.5.2

* For L/b = 20'/60.58' = 0.33 and Immediate Occupancy, m = 1

$mk V_{CE} \geq V_{UD}$

where m = 1

k = 1

Fp Diaph

Trib width for shear for frames @ 20' oc

$V_{UD} = (1625^k \times 10/363.33)(1/60.58)$

$= 738$ #/'

$V_{CE} \geq 738$ #/'

PER FEMA 273 Section 8.5.2.2, $V_{CE} = 120$ #/'

THEREFORE, WOOD DECK IS OVERSTRESSED

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |

DETERMINE EQUIVALENT WALL THICKNESS FOR CONCRETE FRAME AT GROUND FLOOR (LONGITUDINAL DIRECTION)

For 1 kip lateral load and $E = 1/2\,E_c$
(effective stiffness per FEMA 273 Table 6.4)

$\Delta = .009''$ (RISA-2D Output for 1 kip load)

For 1 kip lateral load and $E = 0.8\,E_c$
(per FEMA 273 Table 6.4 for walls)

$$\Delta_{wall} = \frac{1}{.8 \times 3122}\left(\frac{h}{bL}\right)\left[\frac{h^2}{L^2} + 2.64\right]$$

$h$ = 11.75', $b$ = thk, $L$ = 363.33 — same length as longitudinal walls

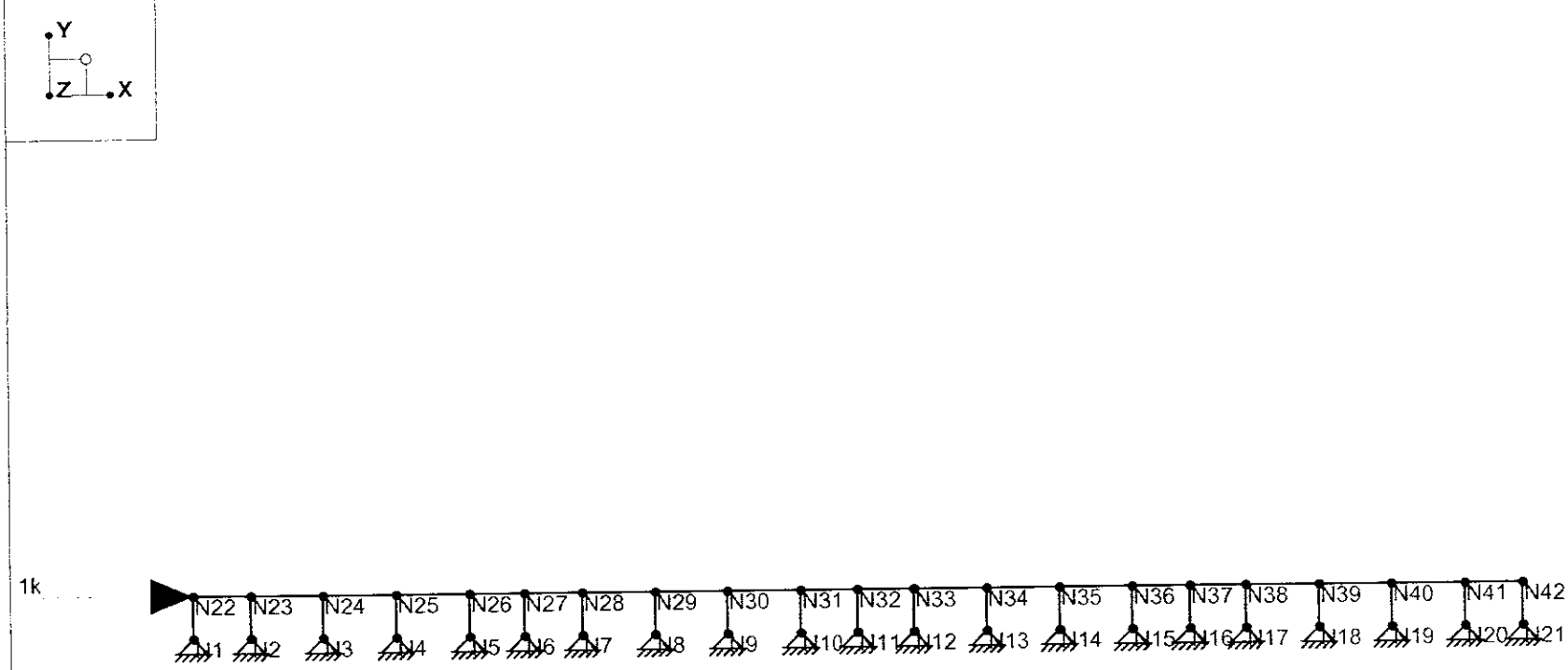
$$= \frac{3.42 \times 10^{-5}}{b_{equiv}}$$

$b_{equiv} = 0.0038''$

Equivalent thicknesses for the front and back longitudinal walls are 5.48" and 5.69", respectively.

∴ CONTRIBUTION OF CONCRETE FRAMES TO THE RIGIDITY OF THE STRUCTURE IS NEGLIGIBLE!

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |
| | | DATE | |




| | | |
|---|---|---|
| Loads: BLC 1, 1 KIP LOAD<br>Results for LC 1, 1 KIP | | |
| Mitsunaga & Associates, Inc. | QUAD C Existing Concrete Frame at Ground Floor | February 5, 2003 |
| Keith Kalani | | 6:20 PM |
| | Frame Rigidity: Deflection for 1 kip load | QUADC-ground.r2d |

A004

Company : **Mitsunaga & Associates, Inc.**
Designer : **Keith Kalani**
Job Number :
**QUAD C Existing Concrete Frame at Ground Floor**

February 5, 2003
6:18 PM
Checked By:_____

## Global

| | |
|---|---|
| Steel Code | None |
| Allowable Stress Increase Factor (ASIF) | 1.333 |
| Include Shear Deformation | Yes |
| No. of Sections for Member Calcs | 5 |
| Redesign Sections | Yes |
| P-Delta Analysis Tolerance | 0.50% |

## Materials (General)

| Material Label | Young's Modulus (ksi) | Shear Modulus (ksi) | Poisson's Ratio | Thermal Coef. (per 10^5 F) | Weight Density (k/ft^3) | Yield Stress (ksi) |
|---|---|---|---|---|---|---|
| CONC | 2015 | 907 | .11 | .65 | .15 | 2.55 |

## Sections

| Section Label | Database Shape | Material Label | Area (in)^2 | SA (0,180) | SA (90,270) | I (90,270) (in^4) | I (0,180) (in^4) | T/C Only |
|---|---|---|---|---|---|---|---|---|
| COL | | CONC | 196 | 1.2 | 1.2 | 3201 | 3201 | |
| BEAM | | CONC | 280 | 1.2 | 1.2 | 4573 | 9333 | |

## Joint Coordinates

| Joint Label | X Coordinate (ft) | Y Coordinate (ft) | Joint Temperature (F) |
|---|---|---|---|
| N1 | 0 | 0 | 0 |
| N2 | 15.67 | 0 | 0 |
| N3 | 35.67 | 0 | 0 |
| N4 | 55.67 | 0 | 0 |
| N5 | 75.67 | 0 | 0 |
| N6 | 90.75 | 0 | 0 |
| N7 | 106.33 | 0 | 0 |
| N8 | 126.33 | 0 | 0 |
| N9 | 146.33 | 0 | 0 |
| N10 | 166.33 | 0 | 0 |
| N11 | 181.92 | 0 | 0 |
| N12 | 197 | 0 | 0 |
| N13 | 217 | 0 | 0 |
| N14 | 237 | 0 | 0 |
| N15 | 257 | 0 | 0 |
| N16 | 272.58 | 0 | 0 |
| N17 | 287.67 | 0 | 0 |
| N18 | 307.67 | 0 | 0 |
| N19 | 327.67 | 0 | 0 |
| N20 | 347.67 | 0 | 0 |
| N21 | 363.33 | 0 | 0 |
| N22 | 0 | 11.75 | 0 |
| N23 | 15.67 | 11.75 | 0 |
| N24 | 35.67 | 11.75 | 0 |
| N25 | 55.67 | 11.75 | 0 |
| N26 | 75.67 | 11.75 | 0 |
| N27 | 90.75 | 11.75 | 0 |
| N28 | 106.33 | 11.75 | 0 |
| N29 | 126.33 | 11.75 | 0 |
| N30 | 146.33 | 11.75 | 0 |
| N31 | 166.33 | 11.75 | 0 |
| N32 | 181.92 | 11.75 | 0 |
| N33 | 197 | 11.75 | 0 |
| N34 | 217 | 11.75 | 0 |
| N35 | 237 | 11.75 | 0 |
| N36 | 257 | 11.75 | 0 |

Company : **Mitsunaga & Associates, Inc.**
Designer : **Keith Kalani**
Job Number :
**QUAD C Existing Concrete Frame at Ground Floor**

February 5, 2003
6:18 PM
Checked By:_____

## Member Data (continued)

| Member Label | I Joint | J Joint | Rotate (degrees) | Shape / Section Set | Material Set | PhysMemb | End Releases I-End TOM | End Releases J-End AVM | End Offsets I-End AVM | End Offsets J-End (in) | Inactive Code (in) | | Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M22 | N22 | N23 | | BEAM | CONC | Y | | | | | | | 15.67 |
| M23 | N23 | N24 | | BEAM | CONC | Y | | | | | | | 20 |
| M24 | N24 | N25 | | BEAM | CONC | Y | | | | | | | 20 |
| M25 | N25 | N26 | | BEAM | CONC | Y | | | | | | | 20 |
| M26 | N26 | N27 | | BEAM | CONC | Y | | | | | | | 15.08 |
| M27 | N27 | N28 | | BEAM | CONC | Y | | | | | | | 15.58 |
| M28 | N28 | N29 | | BEAM | CONC | Y | | | | | | | 20 |
| M29 | N29 | N30 | | BEAM | CONC | Y | | | | | | | 20 |
| M30 | N30 | N31 | | BEAM | CONC | Y | | | | | | | 20 |
| M31 | N31 | N32 | | BEAM | CONC | Y | | | | | | | 15.59 |
| M32 | N32 | N33 | | BEAM | CONC | Y | | | | | | | 15.08 |
| M33 | N33 | N34 | | BEAM | CONC | Y | | | | | | | 20 |
| M34 | N34 | N35 | | BEAM | CONC | Y | | | | | | | 20 |
| M35 | N35 | N36 | | BEAM | CONC | Y | | | | | | | 20 |
| M36 | N36 | N37 | | BEAM | CONC | Y | | | | | | | 15.58 |
| M37 | N37 | N38 | | BEAM | CONC | Y | | | | | | | 15.09 |
| M38 | N38 | N39 | | BEAM | CONC | Y | | | | | | | 20 |
| M39 | N39 | N40 | | BEAM | CONC | Y | | | | | | | 20 |
| M40 | N40 | N41 | | BEAM | CONC | Y | | | | | | | 20 |
| M41 | N41 | N42 | | BEAM | CONC | Y | | | | | | | 15.66 |
| M42 | N1 | N1 | | BEAM | CONC | Y | | | | | | | 0 |

## Basic Load Case Data

| BLC No. | Basic Load Case Description | Category Code | Category Description | Gravity X | Gravity Y | Load Type Totals Joint | Load Type Totals Point | Load Type Totals Direct Dist. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP LOAD | None | | | | 1 | | |

## Joint Loads/Enforced Displacements, Category : None, BLC 1 : 1 KIP LOAD

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N22 | L | X | 1 |

## Load Combinations

| Num | Description | Env | WS | PD | SRSS | CD | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP | y | | | | 1 | 1 | 1 | | | | | | |

## Reactions, By Combination

| LC | Joint Label | X Force (k) | Y Force (k) | Moment (k-ft) |
|---|---|---|---|---|
| 1 | N1 | -.054 | -.07 | 0 |
| 1 | N2 | -.063 | .04 | 0 |
| 1 | N3 | -.057 | -.004 | 0 |
| 1 | N4 | -.055 | .004 | 0 |
| 1 | N5 | -.054 | -.014 | 0 |
| 1 | N6 | -.054 | .003 | 0 |
| 1 | N7 | -.051 | .013 | 0 |
| 1 | N8 | -.049 | 0 | 0 |
| 1 | N9 | -.048 | .002 | 0 |
| 1 | N10 | -.047 | -.01 | 0 |
| 1 | N11 | -.047 | -.001 | 0 |
| 1 | N12 | -.046 | .013 | 0 |

## Reactions, By Combination, (continued)

| LC | Joint Label | X Force (k) | Y Force (k) | Moment (k-ft) |
|---|---|---|---|---|
| 1 | N13 | -.044 | -.001 | 0 |
| 1 | N14 | -.043 | .002 | 0 |
| 1 | N15 | -.043 | -.009 | 0 |
| 1 | N16 | -.043 | -.001 | 0 |
| 1 | N17 | -.042 | .012 | 0 |
| 1 | N18 | -.041 | -.002 | 0 |
| 1 | N19 | -.04 | .004 | 0 |
| 1 | N20 | -.042 | -.025 | 0 |
| 1 | N21 | -.036 | .046 | 0 |
| 1 | Totals: | -1 | 0 | |
| 1 | COG (ft): | NC | NC | |

## Joint Displacements, By Combination

| LC | Joint Label | X Translation (in) | Y Translation (in) | Rotation (radians) |
|---|---|---|---|---|
| 1 | N1 | 0 | 0 | -1.008e-4 |
| 1 | N2 | 0 | 0 | -1.027e-4 |
| 1 | N3 | 0 | 0 | -9.717e-5 |
| 1 | N4 | 0 | 0 | -9.386e-5 |
| 1 | N5 | 0 | 0 | -9.103e-5 |
| 1 | N6 | 0 | 0 | -8.917e-5 |
| 1 | N7 | 0 | 0 | -8.639e-5 |
| 1 | N8 | 0 | 0 | -8.334e-5 |
| 1 | N9 | 0 | 0 | -8.093e-5 |
| 1 | N10 | 0 | 0 | -7.91e-5 |
| 1 | N11 | 0 | 0 | -7.801e-5 |
| 1 | N12 | 0 | 0 | -7.622e-5 |
| 1 | N13 | 0 | 0 | -7.416e-5 |
| 1 | N14 | 0 | 0 | -7.276e-5 |
| 1 | N15 | 0 | 0 | -7.187e-5 |
| 1 | N16 | 0 | 0 | -7.148e-5 |
| 1 | N17 | 0 | 0 | -7.044e-5 |
| 1 | N18 | 0 | 0 | -6.937e-5 |
| 1 | N19 | 0 | 0 | -6.871e-5 |
| 1 | N20 | 0 | 0 | -6.954e-5 |
| 1 | N21 | 0 | 0 | -6.606e-5 |
| 1 | N22 | .01 | 0 | -1.693e-5 |
| 1 | N23 | .01 | 0 | -6.095e-6 |
| 1 | N24 | .01 | 0 | -9.349e-6 |
| 1 | N25 | .009 | 0 | -8.527e-6 |
| 1 | N26 | .009 | 0 | -7.234e-6 |
| 1 | N27 | .009 | 0 | -6.07e-6 |
| 1 | N28 | .008 | 0 | -7.02e-6 |
| 1 | N29 | .008 | 0 | -7.634e-6 |
| 1 | N30 | .008 | 0 | -7.406e-6 |
| 1 | N31 | .008 | 0 | -6.41e-6 |
| 1 | N32 | .008 | 0 | -5.313e-6 |
| 1 | N33 | .007 | 0 | -6.062e-6 |
| 1 | N34 | .007 | 0 | -6.817e-6 |
| 1 | N35 | .007 | 0 | -6.654e-6 |
| 1 | N36 | .007 | 0 | -5.827e-6 |
| 1 | N37 | .007 | 0 | -4.867e-6 |
| 1 | N38 | .007 | 0 | -5.612e-6 |
| 1 | N39 | .007 | 0 | -6.316e-6 |
| 1 | N40 | .007 | 0 | -6.58e-6 |
| 1 | N41 | .007 | 0 | -4.177e-6 |

## Joint Displacements, By Combination, (continued)

| LC | Joint Label | X Translation (in) | Y Translation (in) | Rotation (radians) |
|---|---|---|---|---|
| 1 | N42 | .007 | 0 | -1.102e-5 |

## Member Section Forces, By Combination

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| 1 | M1 | 1 | -.07 | .054 | 0 |
| | | 2 | -.07 | .054 | -.16 |
| | | 3 | -.07 | .054 | -.32 |
| | | 4 | -.07 | .054 | -.479 |
| | | 5 | -.07 | .054 | -.639 |
| 1 | M2 | 1 | .04 | .063 | 0 |
| | | 2 | .04 | .063 | -.184 |
| | | 3 | .04 | .063 | -.368 |
| | | 4 | .04 | .063 | -.553 |
| | | 5 | .04 | .063 | -.737 |
| 1 | M3 | 1 | -.004 | .057 | 0 |
| | | 2 | -.004 | .057 | -.167 |
| | | 3 | -.004 | .057 | -.335 |
| | | 4 | -.004 | .057 | -.502 |
| | | 5 | -.004 | .057 | -.67 |
| 1 | M4 | 1 | .004 | .055 | 0 |
| | | 2 | .004 | .055 | -.163 |
| | | 3 | .004 | .055 | -.325 |
| | | 4 | .004 | .055 | -.488 |
| | | 5 | .004 | .055 | -.651 |
| 1 | M5 | 1 | -.014 | .054 | 0 |
| | | 2 | -.014 | .054 | -.16 |
| | | 3 | -.014 | .054 | -.319 |
| | | 4 | -.014 | .054 | -.479 |
| | | 5 | -.014 | .054 | -.639 |
| 1 | M6 | 1 | .003 | .054 | 0 |
| | | 2 | .003 | .054 | -.158 |
| | | 3 | .003 | .054 | -.317 |
| | | 4 | .003 | .054 | -.475 |
| | | 5 | .003 | .054 | -.634 |
| 1 | M7 | 1 | .013 | .051 | 0 |
| | | 2 | .013 | .051 | -.151 |
| | | 3 | .013 | .051 | -.303 |
| | | 4 | .013 | .051 | -.454 |
| | | 5 | .013 | .051 | -.605 |
| 1 | M8 | 1 | 0 | .049 | 0 |
| | | 2 | 0 | .049 | -.144 |
| | | 3 | 0 | .049 | -.289 |
| | | 4 | 0 | .049 | -.433 |
| | | 5 | 0 | .049 | -.577 |
| 1 | M9 | 1 | .002 | .048 | 0 |
| | | 2 | .002 | .048 | -.14 |
| | | 3 | .002 | .048 | -.28 |
| | | 4 | .002 | .048 | -.42 |
| | | 5 | .002 | .048 | -.561 |
| 1 | M10 | 1 | -.01 | .047 | 0 |
| | | 2 | -.01 | .047 | -.139 |
| | | 3 | -.01 | .047 | -.277 |
| | | 4 | -.01 | .047 | -.416 |
| | | 5 | -.01 | .047 | -.554 |
| 1 | M11 | 1 | -.001 | .047 | 0 |
| | | 2 | -.001 | .047 | -.139 |

## Member Section Forces, By Combination, (continued)

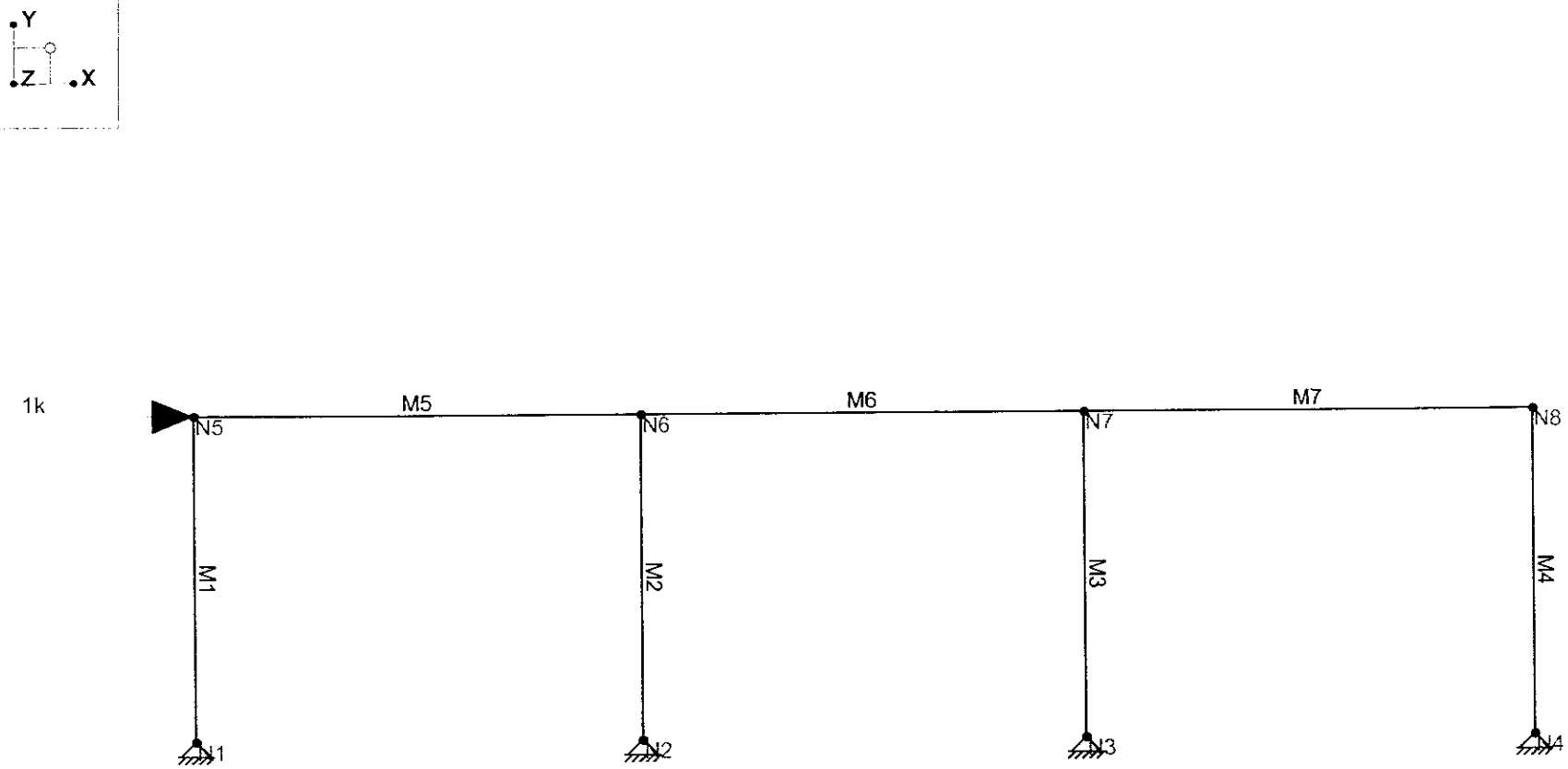
| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| | | 3 | -.001 | .047 | -.277 |
| | | 4 | -.001 | .047 | -.416 |
| | | 5 | -.001 | .047 | -.554 |
| 1 | M12 | 1 | .013 | .046 | 0 |
| | | 2 | .013 | .046 | -.134 |
| | | 3 | .013 | .046 | -.267 |
| | | 4 | .013 | .046 | -.401 |
| | | 5 | .013 | .046 | -.535 |
| 1 | M13 | 1 | -.001 | .044 | 0 |
| | | 2 | -.001 | .044 | -.128 |
| | | 3 | -.001 | .044 | -.257 |
| | | 4 | -.001 | .044 | -.385 |
| | | 5 | -.001 | .044 | -.513 |
| 1 | M14 | 1 | .002 | .043 | 0 |
| | | 2 | .002 | .043 | -.126 |
| | | 3 | .002 | .043 | -.252 |
| | | 4 | .002 | .043 | -.378 |
| | | 5 | .002 | .043 | -.504 |
| 1 | M15 | 1 | -.009 | .043 | 0 |
| | | 2 | -.009 | .043 | -.126 |
| | | 3 | -.009 | .043 | -.252 |
| | | 4 | -.009 | .043 | -.378 |
| | | 5 | -.009 | .043 | -.504 |
| 1 | M16 | 1 | -.001 | .043 | 0 |
| | | 2 | -.001 | .043 | -.127 |
| | | 3 | -.001 | .043 | -.254 |
| | | 4 | -.001 | .043 | -.381 |
| | | 5 | -.001 | .043 | -.508 |
| 1 | M17 | 1 | .012 | .042 | 0 |
| | | 2 | .012 | .042 | -.124 |
| | | 3 | .012 | .042 | -.247 |
| | | 4 | .012 | .042 | -.371 |
| | | 5 | .012 | .042 | -.494 |
| 1 | M18 | 1 | -.002 | .041 | 0 |
| | | 2 | -.002 | .041 | -.12 |
| | | 3 | -.002 | .041 | -.24 |
| | | 4 | -.002 | .041 | -.361 |
| | | 5 | -.002 | .041 | -.481 |
| 1 | M19 | 1 | .004 | .04 | 0 |
| | | 2 | .004 | .04 | -.118 |
| | | 3 | .004 | .04 | -.237 |
| | | 4 | .004 | .04 | -.355 |
| | | 5 | .004 | .04 | -.474 |
| 1 | M20 | 1 | -.025 | .042 | 0 |
| | | 2 | -.025 | .042 | -.125 |
| | | 3 | -.025 | .042 | -.249 |
| | | 4 | -.025 | .042 | -.374 |
| | | 5 | -.025 | .042 | -.498 |
| 1 | M21 | 1 | .046 | .036 | 0 |
| | | 2 | .046 | .036 | -.105 |
| | | 3 | .046 | .036 | -.21 |
| | | 4 | .046 | .036 | -.315 |
| | | 5 | .046 | .036 | -.42 |
| 1 | M22 | 1 | .946 | -.07 | -.639 |
| | | 2 | .946 | -.07 | -.365 |
| | | 3 | .946 | -.07 | -.09 |
| | | 4 | .946 | -.07 | .184 |

## Member Section Forces, By Combination, (continued)

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| | | 5 | .946 | -.07 | .458 |
| 1 | M23 | 1 | .883 | -.03 | -.278 |
| | | 2 | .883 | -.03 | -.129 |
| | | 3 | .883 | -.03 | .021 |
| | | 4 | .883 | -.03 | .171 |
| | | 5 | .883 | -.03 | .321 |
| 1 | M24 | 1 | .826 | -.034 | -.349 |
| | | 2 | .826 | -.034 | -.177 |
| | | 3 | .826 | -.034 | -.005 |
| | | 4 | .826 | -.034 | .166 |
| | | 5 | .826 | -.034 | .338 |
| 1 | M25 | 1 | .771 | -.03 | -.313 |
| | | 2 | .771 | -.03 | -.161 |
| | | 3 | .771 | -.03 | -.008 |
| | | 4 | .771 | -.03 | .144 |
| | | 5 | .771 | -.03 | .296 |
| 1 | M26 | 1 | .716 | -.044 | -.343 |
| | | 2 | .716 | -.044 | -.177 |
| | | 3 | .716 | -.044 | -.01 |
| | | 4 | .716 | -.044 | .156 |
| | | 5 | .716 | -.044 | .323 |
| 1 | M27 | 1 | .662 | -.041 | -.311 |
| | | 2 | .662 | -.041 | -.151 |
| | | 3 | .662 | -.041 | .008 |
| | | 4 | .662 | -.041 | .167 |
| | | 5 | .662 | -.041 | .327 |
| 1 | M28 | 1 | .611 | -.028 | -.279 |
| | | 2 | .611 | -.028 | -.137 |
| | | 3 | .611 | -.028 | .004 |
| | | 4 | .611 | -.028 | .145 |
| | | 5 | .611 | -.028 | .287 |
| 1 | M29 | 1 | .562 | -.029 | -.291 |
| | | 2 | .562 | -.029 | -.146 |
| | | 3 | .562 | -.029 | -.001 |
| | | 4 | .562 | -.029 | .143 |
| | | 5 | .562 | -.029 | .288 |
| 1 | M30 | 1 | .514 | -.027 | -.273 |
| | | 2 | .514 | -.027 | -.14 |
| | | 3 | .514 | -.027 | -.006 |
| | | 4 | .514 | -.027 | .127 |
| | | 5 | .514 | -.027 | .26 |
| 1 | M31 | 1 | .467 | -.037 | -.294 |
| | | 2 | .467 | -.037 | -.152 |
| | | 3 | .467 | -.037 | -.009 |
| | | 4 | .467 | -.037 | .133 |
| | | 5 | .467 | -.037 | .276 |
| 1 | M32 | 1 | .42 | -.038 | -.278 |
| | | 2 | .42 | -.038 | -.136 |
| | | 3 | .42 | -.038 | .006 |
| | | 4 | .42 | -.038 | .149 |
| | | 5 | .42 | -.038 | .291 |
| 1 | M33 | 1 | .374 | -.025 | -.244 |
| | | 2 | .374 | -.025 | -.119 |
| | | 3 | .374 | -.025 | .005 |
| | | 4 | .374 | -.025 | .129 |
| | | 5 | .374 | -.025 | .253 |
| 1 | M34 | 1 | .33 | -.026 | -.26 |

## Member Section Forces, By Combination, (continued)

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| | | 2 | .33 | -.026 | -.131 |
| | | 3 | .33 | -.026 | -.001 |
| | | 4 | .33 | -.026 | .128 |
| | | 5 | .33 | -.026 | .258 |
| 1 | M35 | 1 | .287 | -.024 | -.246 |
| | | 2 | .287 | -.024 | -.126 |
| | | 3 | .287 | -.024 | -.005 |
| | | 4 | .287 | -.024 | .115 |
| | | 5 | .287 | -.024 | .235 |
| 1 | M36 | 1 | .245 | -.033 | -.268 |
| | | 2 | .245 | -.033 | -.138 |
| | | 3 | .245 | -.033 | -.008 |
| | | 4 | .245 | -.033 | .122 |
| | | 5 | .245 | -.033 | .252 |
| 1 | M37 | 1 | .201 | -.035 | -.256 |
| | | 2 | .201 | -.035 | -.125 |
| | | 3 | .201 | -.035 | .006 |
| | | 4 | .201 | -.035 | .138 |
| | | 5 | .201 | -.035 | .269 |
| 1 | M38 | 1 | .159 | -.023 | -.226 |
| | | 2 | .159 | -.023 | -.11 |
| | | 3 | .159 | -.023 | .005 |
| | | 4 | .159 | -.023 | .12 |
| | | 5 | .159 | -.023 | .235 |
| 1 | M39 | 1 | .118 | -.025 | -.246 |
| | | 2 | .118 | -.025 | -.122 |
| | | 3 | .118 | -.025 | .002 |
| | | 4 | .118 | -.025 | .126 |
| | | 5 | .118 | -.025 | .249 |
| 1 | M40 | 1 | .078 | -.021 | -.224 |
| | | 2 | .078 | -.021 | -.12 |
| | | 3 | .078 | -.021 | -.016 |
| | | 4 | .078 | -.021 | .089 |
| | | 5 | .078 | -.021 | .193 |
| 1 | M41 | 1 | .036 | -.046 | -.305 |
| | | 2 | .036 | -.046 | -.124 |
| | | 3 | .036 | -.046 | .057 |
| | | 4 | .036 | -.046 | .238 |
| | | 5 | .036 | -.046 | .42 |




| | | |
|---|---|---|
| Loads: BLC 1, LATERAL<br>Results for LC 1, LATERAL | | |
| Mitsunaga & Associates, Inc. | QUAD C Existing Concrete Frame at 3rd Floor | February 7, 2003 |
| Keith Kalani | | 3:14 PM |
| | 10" square columns and beams | QUADC-EXST.r2d |

A013

Company : **Mitsunaga & Associates, Inc.**
Designer : **Keith Kalani**
Job Number :
**QUAD C Existing Concrete Frame at 3rd Floor**

February 7, 2003
3:11 PM
Checked By:_____

## Global

| | |
|---|---|
| Steel Code | None |
| Allowable Stress Increase Factor (ASIF) | 1.333 |
| Include Shear Deformation | Yes |
| No. of Sections for Member Calcs | 5 |
| Redesign Sections | Yes |
| P-Delta Analysis Tolerance | 0.50% |

## Materials (General)

| Material Label | Young's Modulus (ksi) | Shear Modulus (ksi) | Poisson's Ratio | Thermal Coef. (per 10^5 F) | Weight Density (k/ft^3) | Yield Stress (ksi) |
|---|---|---|---|---|---|---|
| CONC | 1425 | 641 | .16 | .65 | .15 | 2.55 |

## Sections

| Section Label | Database Shape | Material Label | Area (in)^2 | SA (0,180) | SA (90,270) | I (90,270) (in^4) | I (0,180) (in^4) | T/C Only |
|---|---|---|---|---|---|---|---|---|
| COL | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| BEAM | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| SEC3 | | CONC | 1 | 1.2 | 1.2 | 1 | 1 | |

## Joint Coordinates

| Joint Label | X Coordinate (ft) | Y Coordinate (ft) | Joint Temperature (F) |
|---|---|---|---|
| N1 | 0 | 0 | 0 |
| N2 | 16.42 | 0 | 0 |
| N3 | 32.75 | 0 | 0 |
| N4 | 49.17 | 0 | 0 |
| N5 | 0 | 12 | 0 |
| N6 | 16.42 | 12 | 0 |
| N7 | 32.75 | 12 | 0 |
| N8 | 49.17 | 12 | 0 |

## Boundary Conditions

| Joint Label | X Translation (k/in) | Y Translation (k/in) | Rotation (k-ft/rad) |
|---|---|---|---|
| N1 | Reaction | Reaction | |
| N2 | Reaction | Reaction | |
| N3 | Reaction | Reaction | |
| N4 | Reaction | Reaction | |

## Member Data

| Member Label | I Joint | J Joint | Rotate (degrees) | Shape / Section Set | Material Set | Phys Memb | End Releases I-End TOM | End Releases I-End AVM | End Releases J-End AVM | End Offsets I-End (in) | End Offsets J-End (in) | Inactive Code | Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M1 | N1 | N5 | | COL | CONC | Y | | | | | | | 12 |
| M2 | N2 | N6 | | COL | CONC | Y | | | | | | | 12 |
| M3 | N3 | N7 | | COL | CONC | Y | | | | | | | 12 |
| M4 | N4 | N8 | | COL | CONC | Y | | | | | | | 12 |
| M5 | N5 | N6 | | BEAM | CONC | Y | | | | | | | 16.42 |
| M6 | N6 | N7 | | BEAM | CONC | Y | | | | | | | 16.33 |
| M7 | N7 | N8 | | BEAM | CONC | Y | | | | | | | 16.42 |

## Basic Load Case Data

| BLC No. | Basic Load Case Description | Category Code | Category Description | Gravity X | Gravity Y | Load Type Totals Joint | Load Type Totals Point | Load Type Totals Direct Dist. |
|---|---|---|---|---|---|---|---|---|
| 1 | LATERAL | None | | | | 1 | | |

## Joint Loads/Enforced Displacements, Category : None, BLC 1 : LATERAL

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N5 | L | X | 1 |

## Load Combinations

| Num | Description | Env | WS | PD | SRSS | CD | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | LATERAL | y | | | | 1 | 1 | 1 | | | | | | |

## Reactions, By Combination

| LC | Joint Label | X Force (k) | Y Force (k) | Moment (k-ft) |
|---|---|---|---|---|
| 1 | N1 | -.208 | -.274 | 0 |
| 1 | N2 | -.293 | .088 | 0 |
| 1 | N3 | -.292 | -.087 | 0 |
| 1 | N4 | -.207 | .272 | 0 |
| 1 | Totals: | -1 | 0 | |
| 1 | COG (ft): | NC | NC | |

## Joint Displacements, By Combination

| LC | Joint Label | X Translation (in) | Y Translation (in) | Rotation (radians) |
|---|---|---|---|---|
| 1 | N1 | 0 | 0 | -2.823e-3 |
| 1 | N2 | 0 | 0 | -3.06e-3 |
| 1 | N3 | 0 | 0 | -3.053e-3 |
| 1 | N4 | 0 | 0 | -2.805e-3 |
| 1 | N5 | .32 | 0 | -1.004e-3 |
| 1 | N6 | .319 | 0 | -5.031e-4 |
| 1 | N7 | .318 | 0 | -5.025e-4 |
| 1 | N8 | .318 | 0 | -9.965e-4 |

## Member Section Forces, By Combination

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| 1 | M1 | 1 | -.274 | .208 | 0 |
| | | 2 | -.274 | .208 | -.625 |
| | | 3 | -.274 | .208 | -1.25 |
| | | 4 | -.274 | .208 | -1.875 |
| | | 5 | -.274 | .208 | -2.5 |
| 1 | M2 | 1 | .088 | .293 | 0 |
| | | 2 | .088 | .293 | -.878 |
| | | 3 | .088 | .293 | -1.756 |
| | | 4 | .088 | .293 | -2.634 |
| | | 5 | .088 | .293 | -3.512 |
| 1 | M3 | 1 | -.087 | .292 | 0 |
| | | 2 | -.087 | .292 | -.876 |
| | | 3 | -.087 | .292 | -1.752 |
| | | 4 | -.087 | .292 | -2.628 |
| | | 5 | -.087 | .292 | -3.504 |
| 1 | M4 | 1 | .272 | .207 | 0 |
| | | 2 | .272 | .207 | -.621 |
| | | 3 | .272 | .207 | -1.242 |
| | | 4 | .272 | .207 | -1.864 |
| | | 5 | .272 | .207 | -2.485 |
| 1 | M5 | 1 | .792 | -.274 | -2.5 |
| | | 2 | .792 | -.274 | -1.375 |

## Member Section Forces, By Combination, (continued)

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| | | 3 | .792 | -.274 | -.251 |
| | | 4 | .792 | -.274 | .873 |
| | | 5 | .792 | -.274 | 1.997 |
| 1 | M6 | 1 | .499 | -.186 | -1.515 |
| | | 2 | .499 | -.186 | -.758 |
| | | 3 | .499 | -.186 | 0 |
| | | 4 | .499 | -.186 | .757 |
| | | 5 | .499 | -.186 | 1.515 |
| 1 | M7 | 1 | .207 | -.272 | -1.989 |
| | | 2 | .207 | -.272 | -.87 |
| | | 3 | .207 | -.272 | .248 |
| | | 4 | .207 | -.272 | 1.366 |
| | | 5 | .207 | -.272 | 2.485 |

ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" oc
AT 3RD FLOOR

FOR MOMENT FRAMES, MOMENTS ARE DEFORMATION - CONTROLLED:

$$M_{UD} = \cancel{Q_G}^{\,0\ (\text{load directly to columns})} \pm Q_E \quad \ldots\ldots \quad \text{FEMA 310 Eq (4-8)}$$

Expected strength

$$M_{CE} \geq M_{UD}/m$$

where $m = 3$ for $v \leq 3\sqrt{f'_c}$, Immediate Occupancy
$2.5$ for $v \geq 6\sqrt{f'_c}$

FOR MOMENT FRAMES, AXIAL AND SHEAR FORCES ARE FORCE-CONTROLLED:

$$P_{UF} = P_G \pm P_E/CJ \quad \ldots \quad \text{FEMA 310 Eq (4-9)}$$

and

$$V_{UF} = \cancel{V_G}^{\,0\ (\text{load supported on columns})} \pm V_E/CJ$$

where $C = 1.3$ for 1-story conc. fram (3rd Floor Only)

$J = 1.5 + S_{DS}^{0.6} = 2.1$, use 2.0 for IO

$$P_G = \begin{pmatrix} 1.1 \\ 1.1 \end{pmatrix} \begin{pmatrix} .0175 \\ .020 \times 25\% \end{pmatrix} (16 \cdot 38 \times 20) + 1.1 \times .150 \times (0.83)^2 (\overset{col}{6} + \overset{bm}{20})$$

$$= 11.1^k$$

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |
| | | DATE | |

ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" ∝ AT 3RD FLOOR

BEAM CHECK (10"x10")

For a 1kip lateral load, (see RISA-2D output) $M_{max} = 2.5^{1-k}$

$V_{max} = 0.27^{k}$

Seismic force at roof, $F_{roof} = 1787.5^{k}$

Load to frame based on trib. area of flexible diaphragm $= 1787.5 \times 20/364$

$= 98.2^{k}$

$M_{UD}/m = (2.5 \times 98.2)/2.5 = 98.2^{1-k}$

check m:

$V / bwd\sqrt{f'c} = (0.27 \times 98.2)/(10 \times 7.5\sqrt{2500} \times 1.25)$

$= 6.3 > 6$, $m = 2.5$ ok

For 10"x10" beam w/ 3-#4

$b = 10"$

$d = 7.5"$

$f_y = 1.25 \times 40 = 50$ ksi

$f'c = 1.25 \times 2.5 = 3.1$ ksi

$a = \frac{A_s f_y}{.85 f'c\, b} = 1.14"$ ($3 \times .20$)

$M_{CE} = A_s f_y (d - a/2) = 208^{''-k}$

$= 17.3^{1-k} << M_{UD}/m$

∴ BEAM OVERSTRESSED IN FLEXURE

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |

ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" oc
AT 3RD FLOOR

BEAM CHECK (cont.)

$V_E/CJ = (0.27 \times 98.2)/(1.3 \times 2) = 10.2^k$

For 10" x 10" beam w/ 1/4" ϕ stirrups @ 6" oc

$b = 10"$

$d = 7.5"$

$V_{uc} = 2\sqrt{3100}\,(10 \times 7.5) = 8.4^k$

$V_{us} = 0$ (Spacing > d/2)

$V_{uf} = 8.4^k < 10.2^k$ N.G.

∴ BEAM OVERSTRESSED IN SHEAR

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |

ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" oc
AT 3RD FLOOR

COLUMN CHECK (10"x10")

For a 1 kip lateral load, (See RISA-2D Output)

$M_{max} = 3.5^{1-k}$
$V_{max} = 0.29^{k}$
$P_E\ max = 0.27^{k}$

Seismic force at roof, $F_{roof} = 1787.5^{k}$

Load to frame based on trib. area of flexible diaphragm

$= 1787.5 \times 20/364$
$= 98.2^{k}$

$M_{UD}/m = (3.5 \times 98.2)/2.5 = 137^{1-k}$

$P_E/CJ = (0.27 \times 98.2)/(1.3 \times 2) = 10.2^{k}$

$P_{UF} = 0.85[0.85 f'_c (A_g)] = 226^{k} > P_G + \frac{P_E}{CJ}$

($f'_c$: 2.5x1.25; $A_g$: 10x10; $P_G$: 11.1; $P_E$: 10.)

no contribution from reinf., since ties spaced @ 12"oc

∴ COLUMN OK, FOR AXIAL LOADS

For 10"x10" Column w/ 2-#4 E.F.

∴ COLUMN OVERSTRESSED IN FLEXURE (SEE BEAM CHECK)

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |
| | | DATE | |

ANALYSIS OF TRANSVERSE FRAMES @ 20'-0" OC
AT 3RD FLOOR

COLUMN CHECK (CONT.)

$V_E/C_J = (0.29 \times 98.2)/(1.3 \times 2) = 11.0^k$

For 10" x 10" column w/ 1/4"φ ties @12" oc

$b = 10"$

$d = 7.5"$

$V_{uc} = 2\sqrt{2500 \times 1.25}\,(10 \times 7.5) = 8.4^k$

$V_{us} = 0$ (spacing > d/2)

$V_{uF} = 8.4^k < 11.0^k$ NG

∴ COLUMN OVERSTRESSED IN SHEAR

| DESCRIPTION | Mitsunaga & Associates, Inc. | BY: | CHECKED |
|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |
| | | DATE | |

PROJ: SCHOFIELD BARRACKS, QUAD C DATE: 04/20 2002
TITLE: DESIGN LOADS TIME: 15:17 P.M.

TYPICAL FLOOR:

RISE/12 = 0 FACTOR = 1.00

| | WEIGHT (psf) | SLOPE FACTOR | WEIGHT (psf) |
|---|---|---|---|
| 6" THK CONC | 75 | 1.00 | 75.00 |
| PARTITION | 20 | 1.00 | 20.00 |
| CEILING | 3 | 1.00 | 3.00 |
| MECH/MISC | 3 | 1.00 | 3.00 |
| TOTAL DEAD LOAD | | | 101.00 |
| TOTAL LIVE LOAD | 50 | 1.00 | 50.00 |
| TOTAL LOAD | | | 151.00 |

TYPICAL BALCONY:

RISE/12 = 0 FACTOR = 1.00

| | WEIGHT (psf) | SLOPE FACTOR | WEIGHT (psf) |
|---|---|---|---|
| 6" THK CONC | 75 | 1.00 | 75.00 |
| PARTITION | 0 | 1.00 | 0.00 |
| CEILING | 0 | 1.00 | 0.00 |
| MECH/MISC | 3 | 1.00 | 3.00 |
| TOTAL DEAD LOAD | | | 78.00 |
| TOTAL LIVE LOAD | 100 | 1.00 | 100.00 |
| TOTAL LOAD | | | 178.00 |

PROJ: SCHOFIELD BARRACKS, QUAD C DATE: 04/20 2002
TITLE: DESIGN LOADS TIME: 15:17 P.M.

TYPICAL ROOF:

RISE/12 = 0.5 FACTOR = 1.00

| | WEIGHT (psf) | SLOPE FACTOR | WEIGHT (psf) |
|---|---|---|---|
| TAR & GRAVEL | 6 | 1.00 | 6.01 |
| 2x DECKING | 4.5 | 1.00 | 4.50 |
| 2x8 @ 16 RAFTERS | 2 | 1.00 | 2.00 |
| 2x8 @ 16 JOISTS | 2 | 1.00 | 2.00 |
| TRUSSES @ 20 FT | 1.5 | 1.00 | 1.50 |
| CEILING | 3 | 1.00 | 3.00 |
| MECH/MISC | 5 | 1.00 | 5.00 |
| TOTAL DEAD LOAD | | | 24.02 |
| TOTAL LIVE LOAD | 20 | 1.00 | 20.00 |
| TOTAL LOAD | | | 44.02 |

PROJ: QUAD C
TITLE: TYPICAL BUILDING (w/o Retrofit)

DATE: 05-Feb 2003
TIME: 04:02 PM P.M.

V = C*Sa*W
T=Ct*(hn)^3/4

Sxs=2/3*Fa*Ss
Sx1=2/3*Fv*S1
T0=(Sx1*Bs/Sxs*B1)

| | |
|---|---|
| SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER, Ss = | 0.60 |
| SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC, S1 = | 0.17 |

| | | | |
|---|---|---|---|
| PERFORMANCE LEVEL [IO,SE,LS,CP] = | IO | Bs = | 1.00 |
| SOIL CLASS [A, B, C, D, E, F] = | E | B1 = | 1.00 |
| % DAMPING = | 5.000 | T0 = | 0.65 |
| SITE COEFFICIENT, Fa = | 1.5 | C1 = | 1.31 |
| SITE COEFFICIENT, Fv = | 3.4 | C2 = | 1.00 |
| Ct FACTOR [0.035,0.030,0.020,0.060] = | 0.020 | C3 = | 1.00 |
| C FACTOR [1.0,1.1,1.2,1.3,1.4] = | 1.1 | m = | 0.00 |

| | |
|---|---|
| DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER, Sxs = | 0.60 |
| DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC, Sx1 = | 0.39 |
| RESPONSE SPECTRAL ACCELERATION (AT PERIOD T), Sa = | 0.60 |

TOTAL BUILDING HEIGHT = 37.74 FT
BUILDING SEISMIC WEIGHT, W = 8325 KIPS

| | T (SEC) | k | BASE V (KIPS) |
|---|---|---|---|
| TIER 2 EVALUATION | 0.30 | 1.00 | 5494.50 |

BASE SHEAR COEFFICIENT = 0.6600 x W
TOTAL DESIGN BASE SHEAR = 5494.5 KIPS

| Ct | LATERAL SYSTEM | %damping | Bs | B1 |
|---|---|---|---|---|
| 0.035 | Steel Moment Resisting Frames | 2.00 | 0.80 | 0.80 |
| 0.030 | RC Moment Resisting Frames | 5.00 | 1.00 | 1.00 |
| 0.030 | Eccentrically Braced Frames | 10.00 | 1.20 | 1.20 |
| 0.020 | All Oher Buildings | | | |
| 0.060 | Wood Buildings | | | |

PROJ: QUAD C DATE: 05-Feb 2003
TITLE: TYPICAL BUILDING (w/o Retrofit) TIME: 04:02 PM P.M.

| CLASS | SITE DESCRIPTION - SOIL PROFILES |
|---|---|
| A | HARD ROCK, SHEAR WAVE VELOCITY Vs > 5000 FT/S. |
| B | ROCK, SHEAR WAVE VELOCITY Vs FROM 2500 TO 5000 FT/S. |
| C | VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY Vs FROM 1200 TO 2500 FT/S. |
| D | STIFF SOIL, SHEAR WAVE VELOCITY Vs FROM 600 TO 1200 FT/S. |
| E | SOFT SOIL, SHEAR WAVE VELOCITY Vs < 600 FT/S. (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.) |
| F | SOIL REQUIRING SITE-SPECIFIC EVALUATION. |

SITE COEFFICIENT, Fa (Based on Site Class & Spectral Response Acceleration Ss)

| | SPECTRAL RESPONSE ACCELERATION, Ss | | | | |
|---|---|---|---|---|---|
| CLASS | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.20 | 1.20 | 1.10 | 1.00 | 1.00 |
| D | 1.60 | 1.40 | 1.20 | 1.10 | 1.00 |
| E | 2.50 | 1.70 | 1.20 | 0.90 | NA |
| F | NA | NA | NA | NA | NA |

SITE COEFFICIENT, Fv (Based on Site Class & Spectral Response Acceleration S1)

| | SPECTRAL RESPONSE ACCELERATION, S1 | | | | |
|---|---|---|---|---|---|
| CLASS | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 |
| D | 2.40 | 2.00 | 1.80 | 1.60 | 1.50 |
| E | 3.50 | 3.40 | 2.80 | 2.40 | 2.20 |
| F | NA | NA | NA | NA | NA |

A026



PROJ: QUAD C DATE: 06-Feb 2003
TITLE: TYPICAL BUILDING (w/o Retrofit) TIME: 07:26 AM A.M.

INCH-POUND UNITS:

| LEVEL | WEIGHT (kips) | DH (ft) | HEIGHT (ft) | WxH (kips-ft) | FORCE (kips) | SHEAR (kips) | DIAPH Fp (kips) |
|---|---|---|---|---|---|---|---|
| | | | | | | 0.0 | |
| | 0 | | 0.0 | 0.00 | 0.0 | | 0.00 |
| | | 0.0 | | | | 0.0 | |
| | 0 | | 0.0 | 0.00 | 0.0 | | 0.00 |
| | | 0.0 | | | | 0.0 | |
| ROOF | 1606 | | 37.7 | 60610.44 | 1787.5 | | 1624.98 |
| | | 12.6 | | | | 1787.5 | |
| 3RD | 3273 | | 25.2 | 82348.68 | 2428.6 | | 2571.15 |
| | | 12.6 | | | | 4216.0 | |
| 2ND | 3446 | | 12.6 | 43350.68 | 1278.5 | | 2067.60 |
| | | 12.6 | | | | 5494.5 | |
| GRND | | | | | | | |
| | 8325 | 37.7 | | 186309.8 | 5494.5 | | |

A027



PROJECT: QUAD C -- TYPICAL BUILDING DATE: 02/05/03
TITLE: ROOF TIME: 03:58 PM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | ROOF | 0.024 | 25054 | 601.30 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | | | 601.30 |

| BEAMS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| GRID B | 8.00 | 10.00 | 0.083 | 364.00 | 1.00 | 30.33 |
| GRID C | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID D | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID E | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| TRANS | 10.00 | 10.00 | 0.104 | 60.83 | 19.00 | 120.39 |
| GRID 1, 21 | 6.50 | 70.00 | 0.474 | 50.00 | 2.00 | 47.40 |
| | | | | | | 619.00 |

| COLUMNS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 10.00 | 10.00 | 0.104 | 5.58 | 19.00 | 11.04 |
| GRID D | 10.00 | 10.00 | 0.104 | 5.58 | 19.00 | 11.04 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 53.24 |

| WALLS: (ROOF) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 4.69 | 150.00 | 0.059 | 364.00 | 5.58 | 119.07 |
| GRID E | 4.64 | 150.00 | 0.058 | 364.00 | 5.58 | 117.80 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 5.58 | 19.44 |
| GRID 1 | 8.00 | 150.00 | 0.100 | 50.00 | 5.58 | 27.90 |
| GRID 21 | 8.00 | 150.00 | 0.100 | 50.00 | 5.58 | 27.90 |
| GRID 6 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| GRID 11 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| GRID 16 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 5.58 | 0.00 |
| | | | | | | 333.04 |

| | | |
|---|---|---|
| FLOORS | 601.30 | kips |
| BEAMS | 619.00 | kips |
| COLUMNS | 53.24 | kips |
| WALLS | 333.04 | kips |
| | 1606.58 | kips |

A028



PROJECT: QUAD C -- TYPICAL BUILDING DATE: 02/05/03
TITLE: 3RD FL TIME: 03:58 PM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 10.00 | 10.00 | 0.104 | 5.58 | 19.00 | 11.04 |
| GRID D | 10.00 | 10.00 | 0.104 | 5.58 | 19.00 | 11.04 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 12.00 | 0.050 | 6.04 | 19.00 | 5.74 |
| GRID B | 4.00 | 12.00 | 0.050 | 6.04 | 19.00 | 5.74 |
| | | | | | | 116.52 |

| WALLS: (3RD FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 4.69 | 150.00 | 0.059 | 364.00 | 5.58 | 119.07 |
| GRID E | 4.64 | 150.00 | 0.058 | 364.00 | 5.58 | 117.80 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 5.58 | 19.44 |
| GRID 1 | 8.00 | 150.00 | 0.100 | 50.00 | 5.58 | 27.90 |
| GRID 21 | 8.00 | 150.00 | 0.100 | 50.00 | 5.58 | 27.90 |
| GRID 6 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| GRID 11 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| GRID 16 | 2.00 | 150.00 | 0.025 | 50.00 | 5.58 | 6.98 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 6.26 | 150.00 | 0.078 | 364.00 | 6.04 | 172.04 |
| GRID E | 6.18 | 150.00 | 0.077 | 364.00 | 6.04 | 169.84 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 21 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 6 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 11 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 16 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 779.00 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 116.52 | kips |
| WALLS | 779.00 | kips |
| | 3273.22 | kips |

A029



PROJECT: QUAD C -- TYPICAL BUILDING DATE: 02/05/03
TITLE: 2ND FL TIME: 03:58 PM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 12.00 | 0.050 | 6.04 | 19.00 | 5.74 |
| GRID B | 4.00 | 12.00 | 0.050 | 6.04 | 19.00 | 5.74 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 14.00 | 14.00 | 0.204 | 5.46 | 19.00 | 21.18 |
| GRID D | 14.00 | 14.00 | 0.204 | 5.46 | 19.00 | 21.18 |
| GRID E | 6.00 | 14.00 | 0.088 | 6.04 | 19.00 | 10.04 |
| GRID B | 6.00 | 14.00 | 0.088 | 6.04 | 19.00 | 10.04 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 146.40 |

| WALLS: (2ND FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 6.26 | 150.00 | 0.078 | 364.00 | 6.04 | 172.04 |
| GRID E | 6.18 | 150.00 | 0.077 | 364.00 | 6.04 | 169.84 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 21 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 6 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 11 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 16 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 6.79 | 150.00 | 0.085 | 364.00 | 6.04 | 186.60 |
| GRID E | 6.74 | 150.00 | 0.084 | 364.00 | 6.04 | 185.23 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 21 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 6 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 11 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| GRID 16 | 2.00 | 150.00 | 0.025 | 50.00 | 6.04 | 7.55 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 921.88 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 146.40 | kips |
| WALLS | 921.88 | kips |
| | 3445.98 | kips |

A030



PROJECT: QUAD C -- TYPICAL BUILDING
TITLE: ROOF

DATE: 02/05/03
TIME: 03:58 PM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | ROOF | 601.30 | 182.00 | 30.42 | 109436 | 18289 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 109436 | 18289 |

| BEAMS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 172.52 | 182.00 | 60.42 | 31399 | 10424 |
| | GRID B | 30.33 | 182.00 | 49.58 | 5521 | 1504 |
| | GRID C | 37.92 | 182.00 | 33.17 | 6901 | 1258 |
| | GRID D | 37.92 | 182.00 | 16.83 | 6901 | 638 |
| | GRID E | 172.52 | 182.00 | 0.42 | 31399 | 72 |
| | TRANS | 120.39 | 182.00 | 30.42 | 21911 | 3662 |
| | GRID 1, 21 | 47.40 | 182.00 | 30.42 | 8626 | 1442 |
| | | | | | 112657 | 19000 |

| COLUMNS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 11.04 | 182.00 | 33.17 | 2010 | 366 |
| | GRID D | 11.04 | 182.00 | 16.83 | 2010 | 186 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 9690 | 2122 |

| WALLS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 119.07 | 182.00 | 49.67 | 21672 | 5914 |
| | GRID E | 117.80 | 182.00 | 0.33 | 21441 | 39 |
| | GRID A | 19.44 | 182.00 | 60.50 | 3537 | 1176 |
| | GRID 1 | 27.90 | 182.00 | 25.00 | 5078 | 698 |
| | GRID 21 | 27.90 | 182.00 | 25.00 | 5078 | 698 |
| | GRID 6 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | GRID 11 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | GRID 16 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 60613 | 9047 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 109436 | 18289 |
| BEAMS | 112657 | 19000 |
| COLUMNS | 9690 | 2122 |
| WALLS | 60613 | 9047 |
| | 292397.15 | 48457.45 |

CENTER OF MASS X = 182.00
CENTER OF MASS Y = 30.16

PROJECT: QUAD C -- TYPICAL BUILDING
TITLE: 3RD FL

DATE: 02/05/03
TIME: 03:58 PM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 11.04 | 182.00 | 33.17 | 2010 | 366 |
| | GRID D | 11.04 | 182.00 | 16.83 | 2010 | 186 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 5.74 | 182.00 | 0.67 | 1044 | 4 |
| | GRID B | 5.74 | 182.00 | 49.33 | 1044 | 283 |
| | | | | | 21207 | 4436 |

| WALLS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 119.07 | 182.00 | 49.67 | 21672 | 5914 |
| | GRID E | 117.80 | 182.00 | 0.33 | 21441 | 39 |
| | GRID A | 19.44 | 182.00 | 60.50 | 3537 | 1176 |
| | GRID 1 | 27.90 | 182.00 | 25.00 | 5078 | 698 |
| | GRID 21 | 27.90 | 182.00 | 25.00 | 5078 | 698 |
| | GRID 6 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | GRID 11 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | GRID 16 | 6.98 | 182.00 | 25.00 | 1269 | 174 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 172.04 | 182.00 | 49.67 | 31311 | 8545 |
| | GRID E | 169.84 | 182.00 | 0.33 | 30911 | 56 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 21 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 6 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 11 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 16 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 141779 | 20997 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 21207 | 4436 |
| WALLS | 141779 | 20997 |
| | 594722.38 | 97770.97 |

CENTER OF MASS X = 181.69
CENTER OF MASS Y = 29.87

Total center of mass X = 181.79
Total center of mass Y = 29.97

A032



PROJECT: QUAD C -- TYPICAL BUILDING
TITLE: 2ND FL

DATE: 02/05/03
TIME: 03:58 PM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 5.74 | 182.00 | 0.67 | 1044 | 4 |
| | GRID B | 5.74 | 182.00 | 49.33 | 1044 | 283 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 21.18 | 182.00 | 33.17 | 3855 | 703 |
| | GRID D | 21.18 | 182.00 | 16.83 | 3855 | 356 |
| | GRID E | 10.04 | 182.00 | 0.67 | 1828 | 7 |
| | GRID B | 10.04 | 182.00 | 49.33 | 1828 | 495 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 26645 | 5125 |

| WALLS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 172.04 | 182.00 | 49.67 | 31311 | 8545 |
| | GRID E | 169.84 | 182.00 | 0.33 | 30911 | 56 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 21 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 6 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 11 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 16 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 186.60 | 182.00 | 49.67 | 33962 | 9269 |
| | GRID E | 185.23 | 182.00 | 0.33 | 33712 | 61 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 21 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 6 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 11 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | GRID 16 | 7.55 | 182.00 | 25.00 | 1374 | 189 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 167783 | 24629 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 26645 | 5125 |
| WALLS | 167783 | 24629 |
| | 626164.75 | 102091.35 |

CENTER OF MASS X = 181.71
CENTER OF MASS Y = 29.63

Total center of mass X = 181.76
Total center of mass Y = 29.83

**Title :** QUAD C **Job #**
**Dsgnr:** **Date:**
**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, TYPICAL BUILDING -- 2ND FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 5,494.50 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.76 ft |
| X-X Axis Shear | 5,494.50 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 29.83 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.480 | 363.330 | 12.580 | 181.670 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 5.690 | 363.330 | 12.580 | 181.670 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 8.000 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 8.000 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 2.000 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 2.000 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 2.000 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.341 | 2,691.602 | 77.606 | 2,769.208 |
| 2 | 8.341 | 2,794.747 | -77.611 | 2,794.747 |
| 3 | -18.094 | 1,971.159 | 235.737 | 2,206.897 |
| 4 | 18.239 | 1,971.159 | 237.555 | 2,208.714 |
| 5 | -18.094 | 492.790 | 29.498 | 522.287 |
| 6 | 18.239 | 492.790 | 0.076 | 492.866 |
| 7 | 18.239 | 492.790 | 29.718 | 522.507 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.688 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 24.531 ft | Xcm + .05*Max-X - X-cr = | 18.239 ft | Torsion = | 100211.78 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.094 ft | Torsion = | -99,419.89 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.341 ft | Torsion = | 45,828.59 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 2.258 ft | Torsion = | 12,405.55 k-ft |

A034

**Title :** QUAD C **Job #**
**Dsgnr:** **Date:**
**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, TYPICAL BUILDING -- 3RD FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 4,216.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.79 ft |
| X-X Axis Shear | 4,216.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 29.97 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 4.500 | 363.330 | 12.580 | 181.670 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 4.510 | 363.330 | 12.580 | 181.670 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 8.000 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 8.000 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 2.000 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 2.000 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 2.000 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.039 | 2,101.789 | 47.084 | 2,148.873 |
| 2 | 8.039 | 2,106.460 | -47.084 | 2,106.460 |
| 3 | -18.065 | 1,522.210 | 183.587 | 1,705.797 |
| 4 | 18.268 | 1,522.210 | 185.612 | 1,707.822 |
| 5 | -18.065 | 380.553 | 22.972 | 403.525 |
| 6 | 18.268 | 380.553 | 0.059 | 380.612 |
| 7 | 18.268 | 380.553 | 23.220 | 403.772 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.688 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 24.972 ft | Xcm + .05*Max-X - X-cr = | 18.268 ft | Torsion = | 77,019.77 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.065 ft | Torsion = | -76,160.15 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.039 ft | Torsion = | 33,893.25 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 1.956 ft | Torsion = | 8,247.32 k-ft |

A035

**Title :** QUAD C **Job #**
**Dsgnr:** **Date:**
**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, TYPICAL BUILDING -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 0.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 182.00 ft |
| X-X Axis Shear | 1,787.50 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 30.16 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 3.380 | 363.330 | 12.580 | 181.670 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 3.390 | 363.330 | 12.580 | 181.670 | 0.000 | 0.0 | Fix-Pin | 1.0 |
| 3 | 6.000 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 6.000 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 0.500 | 20.000 | 12.580 | 15.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 0.500 | 20.000 | 12.580 | 35.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 0.500 | 20.000 | 12.580 | 55.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 8 | 0.500 | 20.000 | 12.580 | 75.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 9 | 0.500 | 20.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 10 | 0.500 | 20.000 | 12.580 | 106.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 11 | 0.500 | 20.000 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 12 | 0.500 | 20.000 | 12.580 | 146.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 13 | 0.500 | 20.000 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 14 | 0.500 | 20.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 15 | 0.500 | 20.000 | 12.580 | 197.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 16 | 0.500 | 20.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 17 | 0.500 | 20.000 | 12.580 | 237.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 18 | 0.500 | 20.000 | 12.580 | 257.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 19 | 0.500 | 20.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 20 | 0.500 | 20.000 | 12.580 | 287.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 21 | 0.500 | 20.000 | 12.580 | 307.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 22 | 0.500 | 20.000 | 12.580 | 327.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 23 | 0.500 | 20.000 | 12.580 | 347.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.238 | 892.202 | 21.746 | 913.948 |
| 2 | 8.238 | 894.842 | -21.746 | 894.842 |
| 3 | 8.238 | 0.227 | 35.009 | 35.236 |
| 4 | 8.238 | 0.227 | 35.008 | 35.235 |
| 5 | 8.238 | 0.000 | 0.735 | 0.735 |
| 6 | 8.238 | 0.000 | 0.647 | 0.647 |
| 7 | 8.238 | 0.000 | 0.558 | 0.558 |
| 8 | 8.238 | 0.000 | 0.469 | 0.470 |
| 9 | 8.238 | 0.000 | 0.403 | 0.403 |
| 10 | 8.238 | 0.000 | 0.334 | 0.334 |
| 11 | 8.238 | 0.000 | 0.245 | 0.245 |
| 12 | 8.238 | 0.000 | 0.156 | 0.157 |
| 13 | 8.238 | 0.000 | 0.068 | 0.068 |

**Description** QUAD C, TYPICAL BUILDING -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

| | | | | |
|---|---|---|---|---|
| 14 | 8.238 | 0.000 | 0.001 | 0.001 |
| 15 | 8.238 | 0.000 | 0.068 | 0.068 |
| 16 | 8.238 | 0.000 | 0.156 | 0.157 |
| 17 | 8.238 | 0.000 | 0.245 | 0.245 |
| 18 | 8.238 | 0.000 | 0.334 | 0.334 |
| 19 | 8.238 | 0.000 | 0.403 | 0.403 |
| 20 | 8.238 | 0.000 | 0.469 | 0.470 |
| 21 | 8.238 | 0.000 | 0.558 | 0.558 |
| 22 | 8.238 | 0.000 | 0.647 | 0.647 |
| 23 | 8.238 | 0.000 | 0.735 | 0.735 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.667 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 24.963 ft | Xcm + .05*Max-X - X-cr = | 18.499 ft | Torsion = | 0.00 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -17.834 ft | Torsion = | 0.00 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.238 ft | Torsion = | 14,726.17 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 2.155 ft | Torsion = | 3,852.81 k-ft |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:26 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 363.33 | 0.035 | 235078 | 0 | 235078 | NA |
| SOLID STRIP | FIXED | 8.00 | 10.00 | 363.33 | 0.028 | 295774 | 0 | 295774 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 19502 | 19502 | 0.104 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 59105 | 59105 | 0.315 |
| PIER 16 | FIXED | 8.00 | 10.00 | 35.67 | 0.280 | 28253 | 0 | 28253 | 0.151 |
| PIER (17-29) | | | | | 0.000 | 0 | 61222 | 61222 | 0.326 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 19502 | 19502 | 0.104 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 210.01 | TOTAL (PIERS ONLY) = | | | 187584 | 1.000 |
| | | | THKred = | 6.79 | WALL RIGIDITY = | | | 161189 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 28.17 | 0.355 | 21951 | 0 | 21951 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 28.17 | 0.160 | 50514 | 0 | 50514 | NA |
| PIER 1 | FIXED | 8.00 | 4.50 | 18.17 | 0.248 | 32174 | 0 | 32174 | 0.821 |
| PIER 2 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.179 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 39192 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 19502 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 123.67 | 0.081 | 100468 | 0 | 100468 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 123.67 | 0.036 | 223678 | 0 | 223678 | NA |
| PIER 3 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 4 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 5 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 6 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 7 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 8 | FIXED | 8.00 | 4.50 | 2.17 | 2.074 | 1548 | 0 | 1548 | 0.018 |
| PIER 9 | FIXED | 8.00 | 4.50 | 5.83 | 0.772 | 8699 | 0 | 8699 | 0.099 |
| PIER 10 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 11 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 12 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 13 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 14 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| PIER 15 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 63.00 | TOTAL (PIERS ONLY) = | | | 87440 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 59105 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 125.67 | 0.080 | 102100 | 0 | 102100 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 125.67 | 0.036 | 227299 | 0 | 227299 | NA |
| PIER 17 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 18 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 19 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 20 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 21 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 22 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 23 | FIXED | 8.00 | 4.50 | 7.83 | 0.575 | 12674 | 0 | 12674 | 0.139 |
| PIER 24 | FIXED | 8.00 | 4.50 | 2.17 | 2.074 | 1548 | 0 | 1548 | 0.017 |
| PIER 25 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 26 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 27 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 28 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| PIER 29 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.077 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 91415 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 61222 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 28.17 | 0.355 | 21951 | 0 | 21951 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 28.17 | 0.160 | 50514 | 0 | 50514 | NA |
| PIER 30 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.179 |
| PIER 31 | FIXED | 8.00 | 4.50 | 18.17 | 0.248 | 32174 | 0 | 32174 | 0.821 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 39192 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 19502 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 5.48 | 12.58 | 363.33 | 0.035 | 161028 | 0 | 161028 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 161028 | (K/IN) |

A039

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:26 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2769 KIPS

WALL PORTION: GROUND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2769.00 | 8.00 | 4353.96 | 5841.45 | 34834.0 | 0.96 |
| PIER (1-2) | 0.104 | 287.9 | 8.00 | 335.04 | 449.50 | 2878.8 | 1.03 |
| PIER (3-15) | 0.315 | 872.5 | 8.00 | 1481.04 | 1987.02 | 8724.7 | 0.71 |
| PIER 16 | 0.151 | 417.0 | 8.00 | 425.04 | 570.25 | 4170.5 | 1.18 |
| PIER (17-29) | 0.326 | 903.7 | 8.00 | 1505.04 | 2019.22 | 9037.3 | 0.72 |
| PIER (30-31) | 0.104 | 287.9 | 8.00 | 335.04 | 449.50 | 2878.8 | 1.03 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 2769.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.821 | 236.3 | 8.00 | 215.04 | 288.51 | 531.75 | 0.30 |
| PIER 2 | 0.179 | 51.5 | 8.00 | 57.00 | 76.47 | 115.98 | 0.25 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 287.9 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 4 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 5 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 6 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 7 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 8 | 0.018 | 15.5 | 8.00 | 23.04 | 30.91 | 34.76 | 0.18 |
| PIER 9 | 0.099 | 86.8 | 8.00 | 66.96 | 89.84 | 195.29 | 0.35 |
| PIER 10 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 11 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 12 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 13 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 14 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| PIER 15 | 0.080 | 70.0 | 8.00 | 57.00 | 76.47 | 157.55 | 0.33 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 872.5 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 18 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 19 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 20 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 21 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 22 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 23 | 0.139 | 125.3 | 8.00 | 90.96 | 122.04 | 281.90 | 0.37 |
| PIER 24 | 0.017 | 15.3 | 8.00 | 23.04 | 30.91 | 34.44 | 0.18 |
| PIER 25 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 26 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 27 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 28 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| PIER 29 | 0.077 | 69.4 | 8.00 | 57.00 | 76.47 | 156.09 | 0.33 |
| | 1.000 | 903.7 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.179 | 51.5 | 8.00 | 57.00 | 76.47 | 115.98 | 0.25 |
| PIER 31 | 0.821 | 236.3 | 8.00 | 215.04 | 288.51 | 531.75 | 0.30 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 287.9 | | | | | |

A041

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:27 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 363.33 | 0.035 | 235078 | 0 | 235078 | NA |
| SOLID STRIP | FIXED | 8.00 | 10.00 | 363.33 | 0.028 | 295774 | 0 | 295774 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 17975 | 17975 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 41601 | 41601 | 0.278 |
| PIER 16 | FIXED | 8.00 | 10.00 | 35.67 | 0.280 | 28253 | 0 | 28253 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 43746 | 43746 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 17975 | 17975 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 210.01 TOTAL (PIERS ONLY) = 149550 1.000
THKred = 6.26 WALL RIGIDITY = 132280 (K/IN)

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 28.17 | 0.355 | 21951 | 0 | 21951 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 28.17 | 0.231 | 34631 | 0 | 34631 | NA |
| PIER 1 | FIXED | 8.00 | 6.50 | 18.17 | 0.358 | 21768 | 0 | 21768 | 0.848 |
| PIER 2 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 23.17 TOTAL (PIERS ONLY) = 25674 1.000
WALL RIGIDITY = 17975 (K/IN)

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 123.67 | 0.081 | 100468 | 0 | 100468 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 123.67 | 0.053 | 154775 | 0 | 154775 | NA |
| PIER 3 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 4 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 5 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 6 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 7 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 8 | FIXED | 8.00 | 6.50 | 2.17 | 2.995 | 647 | 0 | 647 | 0.013 |
| PIER 9 | FIXED | 8.00 | 6.50 | 5.83 | 1.115 | 5058 | 0 | 5058 | 0.104 |
| PIER 10 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 11 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 12 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 13 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 14 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| PIER 15 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 63.00 TOTAL (PIERS ONLY) = 48672 1.000
WALL RIGIDITY = 41601 (K/IN)

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 125.67 | 0.080 | 102100 | 0 | 102100 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 125.67 | 0.052 | 157282 | 0 | 157282 | NA |
| PIER 17 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 18 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 19 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 20 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 21 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 22 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 23 | FIXED | 8.00 | 6.50 | 7.83 | 0.830 | 7872 | 0 | 7872 | 0.153 |
| PIER 24 | FIXED | 8.00 | 6.50 | 2.17 | 2.995 | 647 | 0 | 647 | 0.013 |
| PIER 25 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 26 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 27 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 28 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| PIER 29 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.076 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 51485 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 43746 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 10.00 | 28.17 | 0.355 | 21951 | 0 | 21951 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 28.17 | 0.231 | 34631 | 0 | 34631 | NA |
| PIER 30 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.152 |
| PIER 31 | FIXED | 8.00 | 6.50 | 18.17 | 0.358 | 21768 | 0 | 21768 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 25674 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 17975 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 4.50 | 12.58 | 363.33 | 0.035 | 132231 | 0 | 132231 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 132231 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:27 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2149 KIPS

WALL PORTION: 2ND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2149.00 | 8.00 | 4353.96 | 5841.45 | 27034.4 | 0.75 |
| PIER (1-2) | 0.120 | 258.3 | 8.00 | 335.04 | 449.50 | 2583.0 | 0.93 |
| PIER (3-15) | 0.278 | 597.8 | 8.00 | 1481.04 | 1987.02 | 5977.9 | 0.48 |
| PIER 16 | 0.189 | 406.0 | 8.00 | 425.04 | 570.25 | 4059.8 | 1.15 |
| PIER (17-29) | 0.293 | 628.6 | 8.00 | 1505.04 | 2019.22 | 6286.2 | 0.50 |
| PIER (30-31) | 0.120 | 258.3 | 8.00 | 335.04 | 449.50 | 2583.0 | 0.93 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 2149.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 219.0 | 8.00 | 215.04 | 288.51 | 711.76 | 0.32 |
| PIER 2 | 0.152 | 39.3 | 8.00 | 57.00 | 76.47 | 127.72 | 0.22 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 258.3 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 4 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 5 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 6 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 7 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 8 | 0.013 | 7.9 | 8.00 | 23.04 | 30.91 | 25.81 | 0.11 |
| PIER 9 | 0.104 | 62.1 | 8.00 | 66.96 | 89.84 | 201.90 | 0.29 |
| PIER 10 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 11 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 12 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 13 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 14 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| PIER 15 | 0.080 | 48.0 | 8.00 | 57.00 | 76.47 | 155.92 | 0.26 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 597.8 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 18 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 19 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 20 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 21 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 22 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 23 | 0.153 | 96.1 | 8.00 | 90.96 | 122.04 | 312.36 | 0.33 |
| PIER 24 | 0.013 | 7.9 | 8.00 | 23.04 | 30.91 | 25.66 | 0.11 |
| PIER 25 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 26 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 27 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 28 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| PIER 29 | 0.076 | 47.7 | 8.00 | 57.00 | 76.47 | 155.00 | 0.26 |
| | 1.000 | 628.6 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 39.3 | 8.00 | 57.00 | 76.47 | 127.72 | 0.22 |
| PIER 31 | 0.848 | 219.0 | 8.00 | 215.04 | 288.51 | 711.76 | 0.32 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 258.3 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:28 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 6.00 | 12.58 | 363.33 | 0.035 | 176082 | 0 | 176082 | NA |
| SOLID STRIP | CANT | 6.00 | 10.00 | 363.33 | 0.028 | 221651 | 0 | 221651 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 13481 | 13481 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 31200 | 31200 | 0.278 |
| PIER 16 | FIXED | 6.00 | 10.00 | 35.67 | 0.280 | 21189 | 0 | 21189 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 32809 | 32809 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 13481 | 13481 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 210.01 | TOTAL (PIERS ONLY) = | | | 112162 | 1.000 |
| | | | THKred = | 4.69 | WALL RIGIDITY = | | | 99175 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.00 | 10.00 | 28.17 | 0.355 | 16463 | 0 | 16463 | NA |
| SOLID STRIP | FIXED | 6.00 | 6.50 | 28.17 | 0.231 | 25974 | 0 | 25974 | NA |
| PIER 1 | FIXED | 6.00 | 6.50 | 18.17 | 0.358 | 16326 | 0 | 16326 | 0.848 |
| PIER 2 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13481 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.00 | 10.00 | 123.67 | 0.081 | 75351 | 0 | 75351 | NA |
| SOLID STRIP | FIXED | 6.00 | 6.50 | 123.67 | 0.053 | 116081 | 0 | 116081 | NA |
| PIER 3 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 4 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 5 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 6 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 7 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 8 | FIXED | 6.00 | 6.50 | 2.17 | 2.995 | 485 | 0 | 485 | 0.013 |
| PIER 9 | FIXED | 6.00 | 6.50 | 5.83 | 1.115 | 3794 | 0 | 3794 | 0.104 |
| PIER 10 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 11 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 12 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 13 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 14 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| PIER 15 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 63.00 | TOTAL (PIERS ONLY) = | | | 36504 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 31200 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.00 | 10.00 | 125.67 | 0.080 | 76575 | 0 | 76575 | NA |
| SOLID STRIP | FIXED | 6.00 | 6.50 | 125.67 | 0.052 | 117962 | 0 | 117962 | NA |
| PIER 17 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 18 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 19 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 20 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 21 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 22 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 23 | FIXED | 6.00 | 6.50 | 7.83 | 0.830 | 5904 | 0 | 5904 | 0.153 |
| PIER 24 | FIXED | 6.00 | 6.50 | 2.17 | 2.995 | 485 | 0 | 485 | 0.013 |
| PIER 25 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 26 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 27 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 28 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| PIER 29 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.076 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 38614 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32809 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.00 | 10.00 | 28.17 | 0.355 | 16463 | 0 | 16463 | NA |
| SOLID STRIP | FIXED | 6.00 | 6.50 | 28.17 | 0.231 | 25974 | 0 | 25974 | NA |
| PIER 30 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.152 |
| PIER 31 | FIXED | 6.00 | 6.50 | 18.17 | 0.358 | 16326 | 0 | 16326 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13481 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 3.38 | 12.58 | 363.33 | 0.035 | 99193 | 0 | 99193 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 99193 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:28 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 913.9 KIPS

WALL PORTION: 3RD FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 913.90 | 6.00 | 4353.96 | 4381.09 | 11496.9 | 0.32 |
| PIER (1-2) | 0.120 | 109.8 | 6.00 | 335.04 | 337.13 | 1098.5 | 0.39 |
| PIER (3-15) | 0.278 | 254.2 | 6.00 | 1481.04 | 1490.27 | 2542.2 | 0.21 |
| PIER 16 | 0.189 | 172.7 | 6.00 | 425.04 | 427.69 | 1726.5 | 0.49 |
| PIER (17-29) | 0.293 | 267.3 | 6.00 | 1505.04 | 1514.42 | 2673.3 | 0.21 |
| PIER (30-31) | 0.120 | 109.8 | 6.00 | 335.04 | 337.13 | 1098.5 | 0.39 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 913.9 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 93.1 | 6.00 | 215.04 | 216.38 | 302.69 | 0.14 |
| PIER 2 | 0.152 | 16.7 | 6.00 | 57.00 | 57.36 | 54.32 | 0.09 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 109.8 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 4 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 5 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 6 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 7 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 8 | 0.013 | 3.4 | 6.00 | 23.04 | 23.18 | 10.98 | 0.05 |
| PIER 9 | 0.104 | 26.4 | 6.00 | 66.96 | 67.38 | 85.86 | 0.12 |
| PIER 10 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 11 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 12 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 13 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 14 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| PIER 15 | 0.080 | 20.4 | 6.00 | 57.00 | 57.36 | 66.31 | 0.11 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 254.2 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 18 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 19 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 20 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 21 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 22 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 23 | 0.153 | 40.9 | 6.00 | 90.96 | 91.53 | 132.84 | 0.14 |
| PIER 24 | 0.013 | 3.4 | 6.00 | 23.04 | 23.18 | 10.91 | 0.05 |
| PIER 25 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 26 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 27 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 28 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| PIER 29 | 0.076 | 20.3 | 6.00 | 57.00 | 57.36 | 65.92 | 0.11 |
| | 1.000 | 267.3 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 16.7 | 6.00 | 57.00 | 57.36 | 54.32 | 0.09 |
| PIER 31 | 0.848 | 93.1 | 6.00 | 215.04 | 216.38 | 302.69 | 0.14 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 109.8 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 363.33 | 0.035 | 235078 | 0 | 235078 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 363.33 | 0.012 | 657418 | 0 | 657418 | NA |
| PIER 1 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| PIER 2 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| PIER 3 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 4 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 5 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 6 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 7 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 8 | FIXED | 8.00 | 4.50 | 7.67 | 0.587 | 12360 | 0 | 12360 | 0.040 |
| PIER 9 | FIXED | 8.00 | 4.50 | 11.00 | 0.409 | 18782 | 0 | 18782 | 0.061 |
| PIER 10 | FIXED | 8.00 | 4.50 | 7.67 | 0.587 | 12360 | 0 | 12360 | 0.040 |
| PIER 11 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 12 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 13 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 14 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 15 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 16 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| PIER 17 | FIXED | 8.00 | 4.50 | 12.17 | 0.370 | 20997 | 0 | 20997 | 0.068 |
| PIER 18 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| PIER 19 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 20 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 21 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 22 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 23 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 24 | FIXED | 8.00 | 4.50 | 7.67 | 0.587 | 12360 | 0 | 12360 | 0.040 |
| PIER 25 | FIXED | 8.00 | 4.50 | 11.00 | 0.409 | 18782 | 0 | 18782 | 0.061 |
| PIER 26 | FIXED | 8.00 | 4.50 | 7.67 | 0.587 | 12360 | 0 | 12360 | 0.040 |
| PIER 27 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 28 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 29 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 30 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 31 | FIXED | 8.00 | 4.50 | 5.00 | 0.900 | 7018 | 0 | 7018 | 0.023 |
| PIER 32 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| PIER 33 | FIXED | 8.00 | 4.50 | 6.42 | 0.701 | 9883 | 0 | 9883 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 6.74

TOTAL (PIERS ONLY) = 307648 1.000
WALL RIGIDITY = 167133 (K/IN)

A050

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 5.69 | 12.58 | 363.33 | 0.035 | 167199 | 0 | 167199 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 167199 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2795 KIPS

WALL PORTION: GROUND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2795.00 | 8.00 | 4353.96 | 5841.45 | 35161.1 | 0.97 |
| PIER 1 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| PIER 2 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| PIER 3 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 4 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 5 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 6 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 7 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 8 | 0.040 | 112.3 | 8.00 | 89.04 | 119.46 | 252.6 | 0.34 |
| PIER 9 | 0.061 | 170.6 | 8.00 | 129.00 | 173.07 | 383.9 | 0.36 |
| PIER 10 | 0.040 | 112.3 | 8.00 | 89.04 | 119.46 | 252.6 | 0.34 |
| PIER 11 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 12 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 13 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 14 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 15 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 16 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| PIER 17 | 0.068 | 190.8 | 8.00 | 143.04 | 191.91 | 429.2 | 0.36 |
| PIER 18 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| PIER 19 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 20 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 21 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 22 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 23 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 24 | 0.040 | 112.3 | 8.00 | 89.04 | 119.46 | 252.6 | 0.34 |
| PIER 25 | 0.061 | 170.6 | 8.00 | 129.00 | 173.07 | 383.9 | 0.36 |
| PIER 26 | 0.040 | 112.3 | 8.00 | 89.04 | 119.46 | 252.6 | 0.34 |
| PIER 27 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 28 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 29 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 30 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 31 | 0.023 | 63.8 | 8.00 | 57.00 | 76.47 | 143.4 | 0.30 |
| PIER 32 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| PIER 33 | 0.032 | 89.8 | 8.00 | 74.04 | 99.34 | 202.0 | 0.33 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 2795.0 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:11 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 363.33 | 0.035 | 235078 | 0 | 235078 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 363.33 | 0.018 | 455109 | 0 | 455109 | NA |
| PIER 1 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| PIER 2 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| PIER 3 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 4 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 5 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 6 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 7 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 8 | FIXED | 8.00 | 6.50 | 7.67 | 0.847 | 7647 | 0 | 7647 | 0.042 |
| PIER 9 | FIXED | 8.00 | 6.50 | 11.00 | 0.591 | 12252 | 0 | 12252 | 0.067 |
| PIER 10 | FIXED | 8.00 | 6.50 | 7.67 | 0.847 | 7647 | 0 | 7647 | 0.042 |
| PIER 11 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 12 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 13 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 14 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 15 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 16 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| PIER 17 | FIXED | 8.00 | 6.50 | 12.17 | 0.534 | 13836 | 0 | 13836 | 0.076 |
| PIER 18 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| PIER 19 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 20 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 21 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 22 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 23 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 24 | FIXED | 8.00 | 6.50 | 7.67 | 0.847 | 7647 | 0 | 7647 | 0.042 |
| PIER 25 | FIXED | 8.00 | 6.50 | 11.00 | 0.591 | 12252 | 0 | 12252 | 0.067 |
| PIER 26 | FIXED | 8.00 | 6.50 | 7.67 | 0.847 | 7647 | 0 | 7647 | 0.042 |
| PIER 27 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 28 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 29 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 30 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 31 | FIXED | 8.00 | 6.50 | 5.00 | 1.300 | 3906 | 0 | 3906 | 0.021 |
| PIER 32 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| PIER 33 | FIXED | 8.00 | 6.50 | 6.42 | 1.012 | 5887 | 0 | 5887 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 6.18

TOTAL (PIERS ONLY) = 182376 1.000
WALL RIGIDITY = 132629 (K/IN)

A053

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 4.51 | 12.58 | 363.33 | 0.035 | 132525 | 0 | 132525 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 132525 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:11 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2106 KIPS

WALL PORTION: 2ND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2106.00 | 8.00 | 4353.96 | 5841.45 | 26493.5 | 0.73 |
| PIER 1 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| PIER 2 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| PIER 3 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 4 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 5 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 6 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 7 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 8 | 0.042 | 88.3 | 8.00 | 89.04 | 119.46 | 287.0 | 0.39 |
| PIER 9 | 0.067 | 141.5 | 8.00 | 129.00 | 173.07 | 459.8 | 0.43 |
| PIER 10 | 0.042 | 88.3 | 8.00 | 89.04 | 119.46 | 287.0 | 0.39 |
| PIER 11 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 12 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 13 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 14 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 15 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 16 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| PIER 17 | 0.076 | 159.8 | 8.00 | 143.04 | 191.91 | 519.3 | 0.44 |
| PIER 18 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| PIER 19 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 20 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 21 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 22 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 23 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 24 | 0.042 | 88.3 | 8.00 | 89.04 | 119.46 | 287.0 | 0.39 |
| PIER 25 | 0.067 | 141.5 | 8.00 | 129.00 | 173.07 | 459.8 | 0.43 |
| PIER 26 | 0.042 | 88.3 | 8.00 | 89.04 | 119.46 | 287.0 | 0.39 |
| PIER 27 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 28 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 29 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 30 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 31 | 0.021 | 45.1 | 8.00 | 57.00 | 76.47 | 146.6 | 0.31 |
| PIER 32 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| PIER 33 | 0.032 | 68.0 | 8.00 | 74.04 | 99.34 | 220.9 | 0.36 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 2106.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 6.00 | 12.58 | 363.33 | 0.035 | 176082 | 0 | 176082 | NA |
| SOLID STRIP | CANT | 6.00 | 6.50 | 363.33 | 0.018 | 341214 | 0 | 341214 | NA |
| PIER 1 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| PIER 2 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| PIER 3 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 4 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 5 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 6 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 7 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 8 | FIXED | 6.00 | 6.50 | 7.67 | 0.847 | 5735 | 0 | 5735 | 0.042 |
| PIER 9 | FIXED | 6.00 | 6.50 | 11.00 | 0.591 | 9189 | 0 | 9189 | 0.067 |
| PIER 10 | FIXED | 6.00 | 6.50 | 7.67 | 0.847 | 5735 | 0 | 5735 | 0.042 |
| PIER 11 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 12 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 13 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 14 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 15 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 16 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| PIER 17 | FIXED | 6.00 | 6.50 | 12.17 | 0.534 | 10377 | 0 | 10377 | 0.076 |
| PIER 18 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| PIER 19 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 20 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 21 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 22 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 23 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 24 | FIXED | 6.00 | 6.50 | 7.67 | 0.847 | 5735 | 0 | 5735 | 0.042 |
| PIER 25 | FIXED | 6.00 | 6.50 | 11.00 | 0.591 | 9189 | 0 | 9189 | 0.067 |
| PIER 26 | FIXED | 6.00 | 6.50 | 7.67 | 0.847 | 5735 | 0 | 5735 | 0.042 |
| PIER 27 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 28 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 29 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 30 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 31 | FIXED | 6.00 | 6.50 | 5.00 | 1.300 | 2930 | 0 | 2930 | 0.021 |
| PIER 32 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| PIER 33 | FIXED | 6.00 | 6.50 | 6.42 | 1.012 | 4415 | 0 | 4415 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 4.64

TOTAL (PIERS ONLY) = 136782 1.000
WALL RIGIDITY = 99410 (K/IN)

A056

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 3.39 | 12.58 | 363.33 | 0.035 | 99486 | 0 | 99486 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 99486 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 894.8 KIPS

WALL PORTION: 3RD FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 894.80 | 6.00 | 4353.96 | 4381.09 | 11256.6 | 0.31 |
| PIER 1 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| PIER 2 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| PIER 3 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 4 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 5 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 6 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 7 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 8 | 0.042 | 37.5 | 6.00 | 89.04 | 89.59 | 121.9 | 0.16 |
| PIER 9 | 0.067 | 60.1 | 6.00 | 129.00 | 129.80 | 195.4 | 0.18 |
| PIER 10 | 0.042 | 37.5 | 6.00 | 89.04 | 89.59 | 121.9 | 0.16 |
| PIER 11 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 12 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 13 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 14 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 15 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 16 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| PIER 17 | 0.076 | 67.9 | 6.00 | 143.04 | 143.93 | 220.6 | 0.19 |
| PIER 18 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| PIER 19 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 20 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 21 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 22 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 23 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 24 | 0.042 | 37.5 | 6.00 | 89.04 | 89.59 | 121.9 | 0.16 |
| PIER 25 | 0.067 | 60.1 | 6.00 | 129.00 | 129.80 | 195.4 | 0.18 |
| PIER 26 | 0.042 | 37.5 | 6.00 | 89.04 | 89.59 | 121.9 | 0.16 |
| PIER 27 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 28 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 29 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 30 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 31 | 0.021 | 19.2 | 6.00 | 57.00 | 57.36 | 62.3 | 0.13 |
| PIER 32 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| PIER 33 | 0.032 | 28.9 | 6.00 | 74.04 | 74.50 | 93.9 | 0.15 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 894.8 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:04 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 31649 | 0 | 31649 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 50.00 | 0.090 | 90215 | 0 | 90215 | NA |
| PIER 1 | FIXED | 8.00 | 4.50 | 6.33 | 0.711 | 9703 | 0 | 9703 | 0.142 |
| PIER 2 | FIXED | 8.00 | 4.50 | 27.33 | 0.165 | 48980 | 0 | 48980 | 0.716 |
| PIER 3 | FIXED | 8.00 | 4.50 | 6.33 | 0.711 | 9703 | 0 | 9703 | 0.142 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 68386 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 28462 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:04 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2209 KIPS

WALL PORTION: GROUND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2209.00 | 8.00 | 594.00 | 796.93 | 27789.2 | 5.68 |
| PIER 1 | 0.142 | 313.4 | 8.00 | 72.96 | 97.89 | 705.2 | 1.18 |
| PIER 2 | 0.716 | 1582.2 | 8.00 | 324.96 | 435.98 | 3559.8 | 1.32 |
| PIER 3 | 0.142 | 313.4 | 8.00 | 72.96 | 97.89 | 705.2 | 1.18 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 2209.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 50.00 | 0.252 | 63298 | 0 | 63298 | NA |
| SOLID STRIP | FIXED | 16.00 | 6.50 | 50.00 | 0.130 | 124523 | 0 | 124523 | NA |
| PIER 1 | FIXED | 16.00 | 6.50 | 6.33 | 1.027 | 11521 | 0 | 11521 | 0.128 |
| PIER 2 | FIXED | 16.00 | 6.50 | 27.33 | 0.238 | 67119 | 0 | 67119 | 0.744 |
| PIER 3 | FIXED | 16.00 | 6.50 | 6.33 | 1.027 | 11521 | 0 | 11521 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 90161 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 53025 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1708 KIPS

WALL PORTION: 2ND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1708.00 | 16.00 | 594.00 | 1593.87 | 21486.6 | 4.36 |
| PIER 1 | 0.128 | 218.3 | 16.00 | 72.96 | 195.77 | 709.3 | 1.18 |
| PIER 2 | 0.744 | 1271.5 | 16.00 | 324.96 | 871.96 | 4132.4 | 1.53 |
| PIER 3 | 0.128 | 218.3 | 16.00 | 72.96 | 195.77 | 709.3 | 1.18 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1708.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID, PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 50.00 | 0.252 | 44520 | 0 | 44520 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 50.00 | 0.130 | 91741 | 0 | 91741 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 8641 | 0 | 8641 | 0.128 |
| PIER 2 | FIXED | 12.00 | 6.50 | 27.33 | 0.238 | 50339 | 0 | 50339 | 0.744 |
| PIER 3 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 8641 | 0 | 8641 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 67621 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 37951 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 01:05 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 35.2 KIPS

WALL PORTION: 3RD FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 35.20 | 12.00 | 594.00 | 1195.40 | 442.8 | 0.09 |
| PIER 1 | 0.128 | 4.5 | 12.00 | 72.96 | 146.83 | 14.6 | 0.02 |
| PIER 2 | 0.744 | 26.2 | 12.00 | 324.96 | 653.97 | 85.2 | 0.03 |
| PIER 3 | 0.128 | 4.5 | 12.00 | 72.96 | 146.83 | 14.6 | 0.02 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 35.2 | | | | | |

A064

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:22 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR CROSS WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 2.00 | 12.58 | 50.00 | 0.252 | 7912 | 0 | 7912 | NA |
| SOLID STRIP | FIXED | 2.00 | 4.50 | 50.00 | 0.090 | 22554 | 0 | 22554 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

TOTAL (PIERS ONLY) = 0 0.000
WALL RIGIDITY = ERROR! (K/IN)

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:22 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 522.5 KIPS

WALL PORTION: GROUND FLOOR CROSS WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 522.50 | 2.00 | 594.00 | 199.23 | 6573.1 | 1.34 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 0.0 | | | | | |

A066

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:14 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR CROSS WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 2.00 | 12.58 | 50.00 | 0.252 | 7912 | 0 | 7912 | NA |
| SOLID STRIP | FIXED | 2.00 | 6.50 | 50.00 | 0.130 | 15565 | 0 | 15565 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

TOTAL (PIERS ONLY) = 0 0.000
WALL RIGIDITY = ERROR! (K/IN)

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: TYPICAL BUILDING

DATE: 02/07/03
TIME: 11:14 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 403.8 KIPS

WALL PORTION: 2ND FLOOR CROSS WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 403.80 | 2.00 | 594.00 | 199.23 | 5079.8 | 1.03 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/07/03
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 2500 PSI

MODULUS OF ELASTICITY = 2850 KSI
SHEAR MODULUS = 1221 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR CROSS WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 2.00 | 12.58 | 50.00 | 0.252 | 7420 | 0 | 7420 | NA |
| SOLID STRIP | CANT | 2.00 | 6.50 | 50.00 | 0.130 | 15290 | 0 | 15290 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

TOTAL (PIERS ONLY) = 0 0.000
WALL RIGIDITY = ERROR! (K/IN)

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/07/03
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3125 PSI

REINFORCING STRENGTH*1.25, Fy 50000 PSI
SHEAR DEMAND MODIFIER, m = 1.5
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 0 KIPS

WALL PORTION: 3RD FLOOR CROSS WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 0.00 | 2.00 | 594.00 | 199.23 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |

# *SEISMIC EVALUATION and REHABILITATION REPORT*

## *APPENDIX B: SEISMIC RETROFIT CALCULATIONS*

WHOLE BARRACKS RENEWAL
BRIGADE COMPLEX, PHASE 3A, QUAD C
FY03 MCA PN52068 & BUP 52069
SCHOFIELD BARRACKS, OAHU, HAWAII

February 2003

PREPARED FOR:

DEPARTMENT OF THE ARMY
U.S. Army Engineer District, Honolulu
Engineering Services Branch
Engineering and Construction Division
Fort Shafter, Hawaii 96858-5440

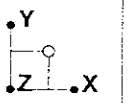
PREPARED BY:

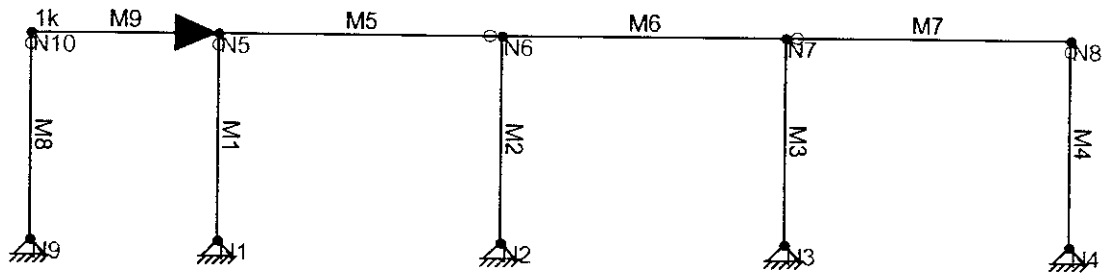
Mitsunaga and Associates, Inc.
747 Amana Street Suite 216
Honolulu, Hawaii 96814
Phone: (808) 945-7882 Fax: (808) 946-2563
Email: Mitsunaga003@hawaii.rr.com

FOR OFFICIAL USE ONLY

Documentation for the proposed seismic retrofit includes the following:

- Dead and live load determination;
- Total building dead load and center of mass determination at each floor level;
- Seismic base shear and force distribution at each floor level;
- Roof diaphragm shear capacity check;
- Estimation of concrete frame rigidities and equivalent solid wall thicknesses;
- Rigidity calculations for shear walls with openings and equivalent solid wall thicknesses;
- Seismic shear distribution to walls based on rigid diaphragm analysis at each floor level and for the roof diaphragm in the longitudinal direction;
- Seismic shear distribution to walls and frames based on flexible diaphragm analysis for the roof diaphragm in the transverse direction; and
- Determination of shear and flexural capacities for walls and frames and comparison with the distributed seismic forces.




Loads: BLC 1, LATERAL
Results for LC 1, LATERAL

| | | |
|---|---|---|
| Mitsunaga & Associates, Inc. | QUAD C Existing Concrete Frame at 3rd Floor | February 1, 2003 |
| Keith Kalani | | 3:49 PM |
| | Retrofit frame in middle bay (second from right) | QUADC-NEW.r2d |

Company : **Mitsunaga & Associates, Inc.**
Designer : **Keith Kalani**
Job Number :
**QUAD C Existing Concrete Frame at 3rd Floor**

February 2, 2003
7:56 AM
Checked By:_____

## Global

| | |
|---|---|
| Steel Code | None |
| Allowable Stress Increase Factor (ASIF) | 1.333 |
| Include Shear Deformation | Yes |
| No. of Sections for Member Calcs | 5 |
| Redesign Sections | Yes |
| P-Delta Analysis Tolerance | 0.50% |

## Materials (General)

| Material Label | Young's Modulus (ksi) | Shear Modulus (ksi) | Poisson's Ratio | Thermal Coef. (per 10^5 F) | Weight Density (k/ft^3) | Yield Stress (ksi) |
|---|---|---|---|---|---|---|
| CONC | 2015 | 907 | .11 | .65 | .15 | 2.55 |

## Sections

| Section Label | Database Shape | Material Label | Area (in)^2 | SA (0,180) | SA (90,270) | I (90,270) (in^4) | I (0,180) (in^4) | T/C Only |
|---|---|---|---|---|---|---|---|---|
| COL | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| BEAM | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| COL2 | | CONC | 384 | 1.2 | 1.2 | 8192 | 18432 | |
| BEAM2 | | CONC | 384 | 1.2 | 1.2 | 8192 | 18432 | |

## Joint Coordinates

| Joint Label | X Coordinate (ft) | Y Coordinate (ft) | Joint Temperature (F) |
|---|---|---|---|
| N1 | 0 | 0 | 0 |
| N2 | 16.42 | 0 | 0 |
| N3 | 32.75 | 0 | 0 |
| N4 | 49.17 | 0 | 0 |
| N5 | 0 | 12 | 0 |
| N6 | 16.42 | 12 | 0 |
| N7 | 32.75 | 12 | 0 |
| N8 | 49.17 | 12 | 0 |
| N9 | -10.83 | 0 | 0 |
| N10 | -10.83 | 12 | 0 |

## Boundary Conditions

| Joint Label | X Translation (k/in) | Y Translation (k/in) | Rotation (k-ft/rad) |
|---|---|---|---|
| N1 | Reaction | Reaction | |
| N2 | Reaction | Reaction | |
| N3 | Reaction | Reaction | |
| N4 | Reaction | Reaction | |
| N9 | Reaction | Reaction | |

## Member Data

| Member Label | I Joint | J Joint | Rotate (degrees) | Shape / Section Set | Material Set | Phys Memb | TOM | End Releases I-End AVM | End Releases J-End AVM | End Offsets I-End (in) | End Offsets J-End (in) | Inactive Code | Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M1 | N1 | N5 | | COL | CONC | Y | | | PIN | | | | 12 |
| M2 | N2 | N6 | | COL2 | CONC | Y | | | | | | | 12 |
| M3 | N3 | N7 | | COL2 | CONC | Y | | | | | | | 12 |
| M4 | N4 | N8 | | COL | CONC | Y | | | PIN | | | | 12 |
| M5 | N5 | N6 | | BEAM | CONC | Y | | | PIN | | | | 16.42 |
| M6 | N6 | N7 | | BEAM2 | CONC | Y | | | | | | | 16.33 |
| M7 | N7 | N8 | | BEAM | CONC | Y | | PIN | | | | | 16.42 |
| M8 | N9 | N10 | | BEAM | CONC | Y | | | PIN | | | | 12 |
| M9 | N10 | N5 | | BEAM | CONC | Y | | | | | | | 10.83 |

## Basic Load Case Data

| BLC No. | Basic Load Case Description | Category Code | Category Description | Gravity X | Gravity Y | Load Type Totals Joint | Point | Direct Dist. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP LOAD | None | | | | 1 | | |
| 2 | GRAVITY | None | | | | 2 | | |
| 3 | 356 LATERAL | None | | | | 1 | | |

## Joint Loads/Enforced Displacements, Category : None, BLC 1 : 1 KIP LOAD

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N5 | L | X | 1 |

## Joint Loads/Enforced Displacements, Category : None, BLC 2 : GRAVITY

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N6 | L | Y | -12 |
| N7 | L | Y | -12 |

## Joint Loads/Enforced Displacements, Category : None, BLC 3 : 356 LATERAL

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N5 | L | X | 69 |

## Load Combinations

| Num | Description | Env | WS | PD | SRSS | CD | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP | y | | | | 1 | 1 | 1 | | | | | | |
| 2 | D+L+E | y | | c | | 1 | 2 | 1 | 3 | 1 | | | | |

## Reactions, By Combination

| LC | Joint Label | X Force (k) | Y Force (k) | Moment (k-ft) |
|---|---|---|---|---|
| 1 | N1 | 0 | 0 | 0 |
| 1 | N2 | -.501 | -.735 | 0 |
| 1 | N3 | -.499 | .735 | 0 |
| 1 | N4 | 0 | 0 | 0 |
| 1 | N9 | 0 | 0 | 0 |
| 1 | Totals: | -1 | 0 | |
| 1 | COG (ft): | NC | NC | |

## Joint Displacements, By Combination

| LC | Joint Label | X Translation (in) | Y Translation (in) | Rotation (radians) |
|---|---|---|---|---|
| 1 | N1 | 0 | 0 | -1.692e-4 |
| 1 | N2 | 0 | 0 | -2.073e-4 |
| 1 | N3 | 0 | 0 | -2.063e-4 |
| 1 | N4 | 0 | 0 | -1.616e-4 |
| 1 | N5 | .024 | 0 | 2.767e-7 |
| 1 | N6 | .023 | 0 | -6.753e-5 |
| 1 | N7 | .023 | 0 | -6.695e-5 |
| 1 | N8 | .023 | 0 | 6.941e-7 |
| 1 | N9 | 0 | 0 | -1.692e-4 |
| 1 | N10 | .024 | 0 | -1.349e-7 |

## Member Section Forces, By Combination

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| 1 | M1 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 1 | M2 | 1 | -.735 | .501 | 0 |
| | | 2 | -.735 | .501 | -1.502 |
| | | 3 | -.735 | .501 | -3.005 |
| | | 4 | -.735 | .501 | -4.507 |
| | | 5 | -.735 | .501 | -6.009 |
| 1 | M3 | 1 | .735 | .499 | 0 |
| | | 2 | .735 | .499 | -1.498 |
| | | 3 | .735 | .499 | -2.995 |
| | | 4 | .735 | .499 | -4.493 |
| | | 5 | .735 | .499 | -5.991 |
| 1 | M4 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 1 | M5 | 1 | 1 | 0 | 0 |
| | | 2 | 1 | 0 | 0 |
| | | 3 | 1 | 0 | 0 |
| | | 4 | 1 | 0 | 0 |
| | | 5 | 1 | 0 | 0 |
| 1 | M6 | 1 | .499 | -.735 | -6.009 |
| | | 2 | .499 | -.735 | -3.009 |
| | | 3 | .499 | -.735 | -.009 |
| | | 4 | .499 | -.735 | 2.991 |
| | | 5 | .499 | -.735 | 5.991 |
| 1 | M7 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 1 | M8 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 1 | M9 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |

Company : Mitsunaga & Associates, Inc.
Designer : Keith Kalani
Job Number :

**QUAD C Existing Concrete Frame at 3rd Floor**

February 2, 2003
7:57 AM
Checked By:_____

## Global

| | |
|---|---|
| Steel Code | None |
| Allowable Stress Increase Factor (ASIF) | 1.333 |
| Include Shear Deformation | Yes |
| No. of Sections for Member Calcs | 5 |
| Redesign Sections | Yes |
| P-Delta Analysis Tolerance | 0.50% |

## Materials (General)

| Material Label | Young's Modulus (ksi) | Shear Modulus (ksi) | Poisson's Ratio | Thermal Coef. (per 10^5 F) | Weight Density (k/ft^3) | Yield Stress (ksi) |
|---|---|---|---|---|---|---|
| CONC | 2015 | 907 | .11 | .65 | .15 | 2.55 |

## Sections

| Section Label | Database Shape | Material Label | Area (in)^2 | SA (0,180) | SA (90,270) | I (90,270) (in^4) | I (0,180) (in^4) | T/C Only |
|---|---|---|---|---|---|---|---|---|
| COL | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| BEAM | | CONC | 100 | 1.2 | 1.2 | 833 | 833 | |
| COL2 | | CONC | 384 | 1.2 | 1.2 | 8192 | 18432 | |
| BEAM2 | | CONC | 384 | 1.2 | 1.2 | 8192 | 18432 | |

## Joint Coordinates

| Joint Label | X Coordinate (ft) | Y Coordinate (ft) | Joint Temperature (F) |
|---|---|---|---|
| N1 | 0 | 0 | 0 |
| N2 | 16.42 | 0 | 0 |
| N3 | 32.75 | 0 | 0 |
| N4 | 49.17 | 0 | 0 |
| N5 | 0 | 12 | 0 |
| N6 | 16.42 | 12 | 0 |
| N7 | 32.75 | 12 | 0 |
| N8 | 49.17 | 12 | 0 |
| N9 | -10.83 | 0 | 0 |
| N10 | -10.83 | 12 | 0 |

## Boundary Conditions

| Joint Label | X Translation (k/in) | Y Translation (k/in) | Rotation (k-ft/rad) |
|---|---|---|---|
| N1 | Reaction | Reaction | |
| N2 | Reaction | Reaction | |
| N3 | Reaction | Reaction | |
| N4 | Reaction | Reaction | |
| N9 | Reaction | Reaction | |

## Member Data

| Member Label | I Joint | J Joint | Rotate (degrees) | Shape / Section Set | Material Set | Phys Memb | TOM | End Releases I-End AVM | End Releases J-End AVM | End Offsets I-End (in) | End Offsets J-End (in) | Inactive Code | Length (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| M1 | N1 | N5 | | COL | CONC | Y | | | PIN | | | | 12 |
| M2 | N2 | N6 | | COL2 | CONC | Y | | | | | | | 12 |
| M3 | N3 | N7 | | COL2 | CONC | Y | | | | | | | 12 |
| M4 | N4 | N8 | | COL | CONC | Y | | | PIN | | | | 12 |
| M5 | N5 | N6 | | BEAM | CONC | Y | | | PIN | | | | 16.42 |
| M6 | N6 | N7 | | BEAM2 | CONC | Y | | | | | | | 16.33 |
| M7 | N7 | N8 | | BEAM | CONC | Y | | PIN | | | | | 16.42 |
| M8 | N9 | N10 | | BEAM | CONC | Y | | | PIN | | | | 12 |
| M9 | N10 | N5 | | BEAM | CONC | Y | | | | | | | 10.83 |

## Basic Load Case Data

| BLC No. | Basic Load Case Description | Category Code | Category Description | Gravity X | Gravity Y | Load Type Totals Joint | Load Type Totals Point | Load Type Totals Direct Dist. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP LOAD | None | | | | 1 | | |
| 2 | GRAVITY | None | | | | 2 | | |
| 3 | 356 LATERAL | None | | | | 1 | | |

## Joint Loads/Enforced Displacements, Category : None, BLC 1 : 1 KIP LOAD

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N5 | L | X | 1 |

## Joint Loads/Enforced Displacements, Category : None, BLC 2 : GRAVITY

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N6 | L | Y | -12 |
| N7 | L | Y | -12 |

## Joint Loads/Enforced Displacements, Category : None, BLC 3 : 356 LATERAL

| Joint Label | [L]oad,[M]ass,or, [D]isplacement | Direction | Magnitude (k, k-ft, in, rad, k*s^2/ft) |
|---|---|---|---|
| N5 | L | X | 69 |

## Load Combinations

| Num | Description | Env | WS | PD | SRSS | CD | BLC | Factor | BLC | Factor | BLC | Factor | BLC | Factor |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 KIP | y | | | | 1 | 1 | 1 | | | | | | |
| 2 | D+L+E | y | | c | | 1 | 2 | 1 | 3 | 1 | | | | |

## Reactions, By Combination

| LC | Joint Label | X Force (k) | Y Force (k) | Moment (k-ft) |
|---|---|---|---|---|
| 2 | N1 | 0 | -.005 | 0 |
| 2 | N2 | -34.909 | -39.23 | 0 |
| 2 | N3 | -34.091 | 63.231 | 0 |
| 2 | N4 | 0 | 0 | 0 |
| 2 | N9 | 0 | .004 | 0 |
| 2 | Totals: | -69 | 24 | |
| 2 | COG (ft): | X: 24.585 | Y: 12 | |

## Joint Displacements, By Combination

| LC | Joint Label | X Translation (in) | Y Translation (in) | Rotation (radians) |
|---|---|---|---|---|
| 2 | N1 | 0 | 0 | -1.179e-2 |
| 2 | N2 | 0 | 0 | -1.445e-2 |
| 2 | N3 | 0 | 0 | -1.438e-2 |
| 2 | N4 | 0 | 0 | -1.126e-2 |
| 2 | N5 | 1.698 | 0 | 1.477e-5 |
| 2 | N6 | 1.631 | .007 | -4.708e-3 |
| 2 | N7 | 1.622 | -.012 | -4.668e-3 |
| 2 | N8 | 1.622 | 0 | 5.972e-5 |
| 2 | N9 | 0 | 0 | -1.179e-2 |
| 2 | N10 | 1.698 | 0 | -7.223e-6 |

## Member Section Forces, By Combination

| LC | Member Label | Section | Axial (k) | Shear (k) | Moment (k-ft) |
|---|---|---|---|---|---|
| 2 | M1 | 1 | -.005 | 0 | 0 |
| | | 2 | -.005 | 0 | 0 |
| | | 3 | -.005 | 0 | 0 |
| | | 4 | -.005 | 0 | 0 |
| | | 5 | -.005 | 0 | 0 |
| 2 | M2 | 1 | -39.23 | 34.909 | 0 |
| | | 2 | -39.23 | 34.909 | -104.726 |
| | | 3 | -39.23 | 34.909 | -209.452 |
| | | 4 | -39.23 | 34.909 | -314.178 |
| | | 5 | -39.23 | 34.909 | -418.904 |
| 2 | M3 | 1 | 63.231 | 34.803 | 0 |
| | | 2 | 63.231 | 34.803 | -104.41 |
| | | 3 | 63.231 | 34.803 | -208.82 |
| | | 4 | 63.231 | 34.803 | -313.231 |
| | | 5 | 63.231 | 34.803 | -417.641 |
| 2 | M4 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 2 | M5 | 1 | 69 | -.003 | -.047 |
| | | 2 | 69 | -.003 | -.036 |
| | | 3 | 69 | -.003 | -.024 |
| | | 4 | 69 | -.003 | -.012 |
| | | 5 | 69 | -.003 | 0 |
| 2 | M6 | 1 | 34.091 | -51.227 | -418.904 |
| | | 2 | 34.091 | -51.227 | -209.768 |
| | | 3 | 34.091 | -51.227 | -.632 |
| | | 4 | 34.091 | -51.227 | 208.504 |
| | | 5 | 34.091 | -51.227 | 417.641 |
| 2 | M7 | 1 | 0 | 0 | 0 |
| | | 2 | 0 | 0 | 0 |
| | | 3 | 0 | 0 | 0 |
| | | 4 | 0 | 0 | 0 |
| | | 5 | 0 | 0 | 0 |
| 2 | M8 | 1 | .004 | 0 | 0 |
| | | 2 | .004 | 0 | 0 |
| | | 3 | .004 | 0 | 0 |
| | | 4 | .004 | 0 | 0 |
| | | 5 | .004 | 0 | 0 |
| 2 | M9 | 1 | 0 | .004 | 0 |
| | | 2 | 0 | .004 | -.012 |
| | | 3 | 0 | .004 | -.024 |
| | | 4 | 0 | .004 | -.036 |
| | | 5 | 0 | .004 | -.047 |

DESIGN OF ONE-BAY FRAMES @ 20'-0" oc
AT 3RD FLOOR

FOR MOMENT FRAMES, MOMENTS ARE DEFORMATION-CONTROLLED:

$$M_{UD} = \cancel{M_G}^{\,0\ (\text{load directly to columns})} \pm M_E \quad \ldots\ldots \text{FEMA 273, Eq (3-14)}$$

Expected Strength:

$$M_{CE} \geq M_{UD}/m \quad \ldots\ldots \text{FEMA 273, Table 6-10}$$

$m = 2$ (Immediate Occupancy, IO)

FOR MOMENT FRAMES, AXIAL and SHEAR FORCES ARE FORCE-CONTROLLED:

$$P_{UF} = P_G \pm \frac{P_E}{C_1 C_2 C_3 J}$$

$$V_{UF} = \cancel{V_G}^{\,0} \pm \frac{V_e}{C_1 C_2 C_3 J}$$

$$P_G = \begin{pmatrix} 1.1 \\ 1.1 \end{pmatrix}\begin{pmatrix} .0175 \\ .020 \times 25\% \end{pmatrix}(16.58 \times 20)$$

$$+ 1.1 \times .150 \times (1.33)^2 (6 + 8.17)$$

$$= 12.3^k$$

$C_1 = 1.28$

$C_2 = 1$

$C_3 = 1$

$J = 1.0 + 5 \times 5^{-.6} = 1.6$

$$P_{UF} = 12.3 \pm 0.49\, P_E$$

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|---|---|---|---|
| | PROJECT: QUAD C | JOB NO. | SHEET OF |
| | | DATE | |

# DESIGN OF ONE-BAY FRAMES @ 20'-0" oc AT 3RD FLOOR

## BEAM FORCES (16" x 24")

For a 1 kip lateral load, (See RISA-2D Output)

$M_{max} = 6^{1\text{-}k}$

$V_{max} = 0.735^{k}$

For flexible roof diaphragm in transverse direction, max. seismic force at 3rd Floor = $25.15^{k}$ (Bldg 356)

Load to frame based on trib area $= 25.15 \times 20/364$

$= 138^{k}$

$M_{CE} \geq M_{UD}/m = 138 \times 6/2 = 415^{1\text{-}k}$ — Use 419 1-k (PΔ effects)

$V_{CE} \geq 0.49\,V_E = 138 \times .49 \times .735 = 50.7^{k}$ — Use 51.2 k (PΔ effects)

check m:

$V/(b_w d\sqrt{f'_c}) = 51.2/(16 \times 21.5\sqrt{4000 \times 1.25})$

$= 2.10 < 3$ ok

* For non-conforming stirrups, with $\rho = \rho'$, $\boxed{m = 2}$

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# DESIGN OF ONE-BAY FRAMES @ 20'-0" oc AT 3RD FLOOR (cont.)

## Determine moment capacity of flexural members

$$\phi M_{CE} = A_s f_y^* \left( d - a/2 \right)$$

where $\phi = 1$ .... FEMA 273, Sec 6.4.2.2

$f_y^* = 1.25 F_y$ "

$f_c'^* = 1.25 f_c'$ ... TI 809-05, Sec 5-2(4)a

$d$ = depth

$$a = \frac{A_s f_y^*}{0.85 f_c'^* b}$$

$$M_{CE} = M_{UD}/m$$

$$M_{UD}/m = A_s f_y^* \left( d - \frac{A_s f_y^*}{0.85 f_c' b \times 2} \right)$$

Solve for As:

1-k to 11-k

$$\therefore \quad A_{s\,reqd} = \frac{d - \sqrt{d^2 - \frac{2 \times M_{UD} \times 12}{.85 f_c'^* b\, m}}}{f_y^* / (.85 f_c'^* b)}$$

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DESIGN OF ONE-BAY FRAMES @ 20'-0" oc
AT 3RD FLOOR

BEAM DESIGN (16" x 24")

$b = 16"$

$d = 24 - 2.5 = 21.5"$

$M_{UD}/M = 415^{1\text{-}k}$

$f'_c{}^* = 1.25 \times 4 = 5\ ksi$

$f_y{}^* = 1.25 \times 60 = 75\ ksi$

$$A_{s\,req'd} = \frac{21.5 - \sqrt{21.5^2 - \frac{2(419 \times 12)}{.85 \times 5 \times 16}}}{75/(.85 \times 5 \times 16)}$$

$= 3.42\ in^2$ 3 - #10 (T&B) or 4 - #9

$V_{UF} \times .49 = 51.2^k$

$V_c = 2\sqrt{4000 \times 1.25}\ (16 \times 21.5) = 48.6^k$

∴ PROVIDE MIN REINFORCING (#4 @ 10" oc)

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# DESIGN OF ONE BAY FRAMES @ 20'-0" oc AT 3RD FLOOR

## COLUMN FORCES (16" x 24")

For a 1 kip lateral load, $M_{max} = 6^{1-k}$

$V_{max} = 0.5^k$

$P_{max} = 0.735^k$

For flexible roof diaphragm in transverse direction,
max seismic force at 3rd Floor = $2515^k$
(Bldg 356)

Load to frame based on trib area = $138^k$

$M_{CE} \geq M_{UD}/m = 138 \times 6/2 = 415^{1-k}$

$V_{UF} \geq 0.49\, V_E = 138 \times .49 \times .735 = 50.7^k$

(Input to PE into RISA-2D

$P_{UF} \geq P_{UF}/K = 12.3 + 0.49(.735 \times 138)$

└ 1.0 (knowledge Factor)

$= 62.0^k$

└ $63.2^k$ (for PΔ effects)

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DESIGN OF ONE-BAY FRAMES @ 20'-0" oc AT 3RD FLOOR

COLUMN DESIGN (16"x24")

From RISA-2D Output
(Load Combination #2)

$P = 63.2^k$ , Includes PΔ effects

$M = 418^k$

For short columns,

$$P_{uf} = 0.85[0.85 f_c'^{*}(A_g - A_{st}) + f_y^{*} A_{st}]$$

where $f_c'^{*} = 1.25 \times 4 = 5$ ksi

$f_y^{*} = 1.25 \times 60 = 75$ ksi

$A_g = 16 \times 24 = 384 \text{ in}^2$

$A_{st} = 8 - \#10 = 10.16 \text{ in}^2$

$$P_{uf} = 0.85[.85(5)(384-10.16) + 75(10.16)]$$
$$\doteq 1998^k$$

* Since $P/P_{uf} = 0.03$, design column as a beam (moment only) → conservative

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DETERMINE EQUIVALENT WALL THICKNESS FOR CONCRETE FRAMES AT 3RD FLOOR

For 1 kip lateral load and
$E = 1/2\, E_c$ (effective stiffness per FEMA 273 Table 6-4)

$\Delta = 0.03''$ (RISA-2D output for 1 kip load)

For 1 kip lateral load and
$E = 0.8\, E_c$ (per FEMA 273 Table 6-4)

$$\Delta = \frac{1}{.8 \times 3122}\left(\frac{\overset{12'}{h}}{\underset{\text{thick}}{b}\,\underset{16.33'\ \text{(middle bay)}}{L}}\right)\left[\frac{4h^2}{L^2} + 2.64\right]$$

$$= \frac{.0014}{b}$$

$$b_{equiv} = \frac{.0014}{0.03} = .047''$$

∴ USE 1/2" THICK TRANSVERSE WALLS (CONS.) FOR SHEAR DISTRIBUTION AT ROOF DIAPHRAGM*.

* DIAPHRAGM IS RIGID IN LONGITUDINAL DIRECTION !!!

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# ROOF DIAPHRAGM

SHEAR CAPACITY OF THE METAL DECK ROOF IS A FORCE-CONTROLLED ACTION:

FEMA 273 Sec. 5.8.1.3

$$V_{UF} \geq \cancel{V_G}^{\,0} \pm \frac{V_E}{C_1 C_2 C_3 J}$$

$C_1 = 1.28$

$C_2 = 1$

$C_3 = 1$

$J = 1.0 + S_{XS} = 1.6 < 2.00$ ok (0.6)

$V_{UF} \geq 0.49 V_E$

For flexible roof diaphragm in transverse direction, max. seismic force at 3rd Floor: 2515k (Bldg 356)

Diaphragm shear based on trib area: 2515x 10'/364'

(for frames @ 20'-0" oc, shear is ± 1/2 of span) = 69k/60.58'

= 1141 # per linear foot

Allowable capacity of deck

$V_{allow} = V_{UF}/2$ (SEE FEMA 273 Sec. 5.8.1.3)

$V_{allow} \geq 1/2\,(1141 \times .49) = 279\ \#/'$

∴ 22ga MIN. DECK ok

480#/' for button punch

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# Type HSB-36

B017

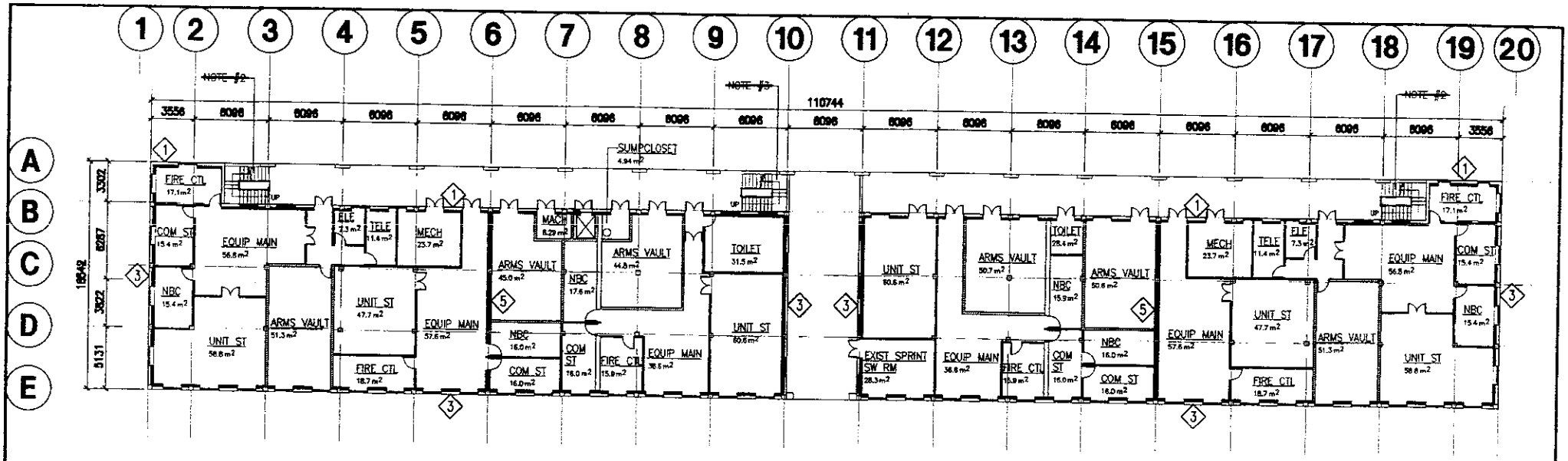
**DIAPHRAGM SHEAR VALUES (q) (Lbs/L.F.) AND FLEXIBILITY FACTORS (F)**

**PRIME PAINTED OR GALVANIZED**

| Gage | Side Lap Connection | Welds per Sheet to Supports | Span 5'-0" 5 | 5'-0" 7 | 6'-0" 5 | 6'-0" 7 | 7'-0" 5 | 7'-0" 7 | 8'-0" 5 | 8'-0" 7 | 9'-0" 5 | 9'-0" 7 | 10'-0" 5 | 10'-0" 7 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | BP @ 24" c/c | q | 260 | 430 | 240 | 400 | 240 | 380 | 230 | 370 | 230 | 340 | 220 | 310 |
| | | F | 5.5+ 155.9R | 5.0+ 56.1R | 6.9+ 130R | 6.1+ 46.8R | 8.4+ 111R | 7.5+ 40.1R | 10.3+ 97.4R | 9.3+ 35.1R | 12.4+ 86.6R | 11.4+ 31.2R | 14.9+ 77.9R | 13.8+ 28.1R |
| | BP @ 12" c/c | q | 310 | 480 | 300 | 460 | 300 | 440 | 290 | 430 | 290 | 400 | 280 | 360 |
| | | F | 5.0+ 155.9R | 4.7+ 56.1R | 6.0+ 130R | 5.7+ 46.8R | 7.3+ 111R | 6.9+ 40.1R | 8.7+ 97.4R | 8.4+ 35.1R | 10.4+ 86.6R | 10.1+ 31.2R | 12.4+ 77.9R | 12.2+ 28.1R |
| | TSW @ 24" c/c | q | 490 | 620 | 430 | 530 | 420 | 500 | 420 | 490 | 410 | 490 | 380 | 480 |
| | | F | 5.8+ 155.9R | 5.3+ 56.1R | 6.3+ 130R | 5.8+ 46.8R | 6.5+ 111R | 6.2+ 40.1R | 6.6+ 97.4R | 6.5+ 35.1R | 6.6+ 86.6R | 6.8+ 31.2R | 6.6+ 77.9R | 6.9+ 28.1R |
| | TSW @ 12" c/c | q | 600 | 690 | 600 | 680 | 630 | 680 | 670 | 700 | 690 | 740 | 660 | 760 |
| | | F | 5.2+ 155.9R | 5.1+ 56.1R | 5.3+ 130R | 5.2+ 46.8R | 5.3+ 111R | 5.4+ 40.1R | 5.2+ 97.4R | 5.4+ 35.1R | 5.1+ 86.6R | 5.4+ 31.2R | 5.0+ 77.9R | 5.4+ 28.1R |
| 20 | BP @ 24" c/c | q | 390 | 670 | 360 | 610 | 360 | 530 | 350 | 470 | 320 | 420 | 290 | 380 |
| | | F | 5.7+ 90.0R | 4.5+ 32.4R | 6.6+ 75R | 5.7+ 27R | 8.2+ 64.3R | 7.2+ 23.2R | 10.2+ 56.3R | 9.0+ 20.3R | 12.5+ 50R | 11.2+ 18R | 15.1+ 45.0R | 13.7+ 16.2R |
| | BP @ 12" c/c | q | 450 | 730 | 440 | 690 | 430 | 600 | 420 | 530 | 380 | 480 | 350 | 440 |
| | | F | 5.3+ 90.0R | 4.8+ 32.4R | 5.9+ 75R | 5.4+ 27R | 7.2+ 64.3R | 6.7+ 23.2R | 8.8+ 56.3R | 8.3+ 20.3R | 10.7+ 50R | 10.1+ 18R | 12.8+ 45.0R | 12.3+ 16.2R |
| | TSW @ 24" c/c | q | 620 | 790 | 540 | 680 | 520 | 630 | 520 | 610 | 540 | 610 | 520 | 610 |
| | | F | 5.4+ 90.0R | 4.9+ 32.4R | 5.9+ 75R | 5.4+ 27R | 6.2+ 64.3R | 5.9+ 23.2R | 6.3+ 56.3R | 6.2+ 20.3R | 6.3+ 50R | 6.4+ 18R | 6.3+ 45.0R | 6.6+ 16.2R |
| | TSW @ 12" c/c | q | 760 | 890 | 750 | 840 | 780 | 840 | 820 | 860 | 880 | 900 | 880 | 960 |
| | | F | 4.9+ 90.0R | 4.6+ 32.4R | 4.9+ 75R | 4.8+ 27R | 4.9+ 64.3R | 5.0+ 23.2R | 4.9+ 56.3R | 5.1+ 20.3R | 4.8+ 50R | 5.1+ 18R | 4.6+ 45.0R | 5.1+ 16.2R |
| 18 | BP @ 24" c/c | q | 750 | 1050 | 640 | 860 | 550 | 740 | 490 | 650 | 440 | 590 | 400 | 530 |
| | | F | 5.3+ 38.2R | 4.5+ 13.7R | 6.2+ 31.8R | 5.3+ 11.4R | 7.9+ 27.3R | 6.8+ 9.8R | 10.0+ 23.8R | 8.7+ 8.6R | 12.5+ 21.2R | 10.9+ 7.6R | 15.3+ 19.1R | 13.6+ 6.9R |
| | BP @ 12" c/c | q | 830 | 1110 | 720 | 930 | 630 | 800 | 560 | 710 | 500 | 640 | 450 | 580 |
| | | F | 5.0+ 38.2R | 4.4+ 13.7R | 5.7+ 31.8R | 5.0+ 11.4R | 7.2+ 27.3R | 6.4+ 9.8R | 9.0+ 23.8R | 8.1+ 8.6R | 11.1+ 21.2R | 10.2+ 7.6R | 13.6+ 19.1R | 12.6+ 6.9R |
| | TSW @ 24" c/c | q | 880 | 1120 | 760 | 950 | 730 | 880 | 720 | 840 | 730 | 830 | 750 | 830 |
| | | F | 4.9+ 38.2R | 4.3+ 13.7R | 5.5+ 31.8R | 4.9+ 11.4R | 5.8+ 27.3R | 5.4+ 9.8R | 6.0+ 23.8R | 5.8+ 8.6R | 6.0+ 21.2R | 6.1+ 7.6R | 6.0+ 19.1R | 6.3+ 6.9R |
| | SSW @ 24" c/c | q | 1020 | 1370 | 1010 | 1200 | 920 | 1080 | 860 | 990 | 810 | 930 | 770 | 870 |
| | | F | 6.7+ 38.2R | 6.1+ 13.7R | 6.1+ 31.4R | 5.3+ 11.3R | 5.9+ 26.9R | 5.2+ 9.7R | 5.7+ 23.5R | 5.1+ 8.5R | 5.5+ 20.9R | 4.9+ 7.5R | 5.4+ 18.8R | 4.8+ 6.8R |
| | TSW @ 12" c/c | q | 1050 | 1250 | 1010 | 1160 | 1040 | 1140 | 1090 | 1150 | 1160 | 1190 | 1250 | 1260 |
| | | F | 4.4+ 38.2R | 4.1+ 13.7R | 4.5+ 31.8R | 4.4+ 11.4R | 4.5+ 27.3R | 4.6+ 9.8R | 4.5+ 23.8R | 4.7+ 8.6R | 4.4+ 21.2R | 4.7+ 7.6R | 4.3+ 19.1R | 4.7+ 6.9R |
| | SSW @ 12" c/c | q | 1570 | 1810 | 1470 | 1660 | 1390 | 1550 | 1330 | 1460 | 1280 | 1390 | 1240 | 1340 |
| | | F | 5.4+ 38.2R | 5.1+ 13.7R | 4.7+ 31.4R | 4.5+ 11.3R | 4.5+ 26.9R | 4.4+ 9.7R | 4.3+ 23.5R | 4.2+ 8.5R | 4.2+ 20.9R | 4.1+ 7.5R | 4.0+ 18.8R | 4.0+ 6.8R |
| 16 | BP @ 24" c/c | q | 1000 | 1350 | 820 | 1110 | 700 | 950 | 620 | 840 | 550 | 750 | 500 | 680 |
| | | F | 5.4+ 19.5R | 4.5+ 7.0R | 6.0+ 16.2R | 5.0+ 5.8R | 7.8+ 13.9R | 6.5+ 5.0R | 9.9+ 12.2R | 8.5+ 4.4R | 12.5+ 10.8R | 10.8+ 3.9R | 15.5+ 9.7R | 13.5+ 3.5R |
| | BP @ 12" c/c | q | 1080 | 1400 | 900 | 1170 | 780 | 1010 | 680 | 890 | 610 | 800 | 560 | 720 |
| | | F | 5.1+ 19.5R | 4.4+ 7.0R | 5.5+ 16.2R | 4.8+ 5.8R | 7.2+ 13.9R | 6.2+ 5.0R | 9.1+ 12.2R | 8.0+ 4.4R | 11.4+ 10.8R | 10.2+ 3.9R | 14.1+ 9.7R | 12.8+ 3.5R |
| | TSW @ 24" c/c | q | 1130 | 1440 | 970 | 1220 | 920 | 1120 | 900 | 1070 | 910 | 1040 | 930 | 1040 |
| | | F | 5.0+ 19.5R | 4.4+ 7.0R | 5.2+ 16.2R | 4.6+ 5.8R | 5.6+ 13.9R | 5.1+ 5.0R | 5.8+ 12.2R | 5.5+ 4.4R | 5.9+ 10.8R | 5.9+ 3.9R | 6.0+ 9.7R | 6.1+ 3.5R |
| | SSW @ 24" c/c | q | 1480 | 1890 | 1420 | 1780 | 1310 | 1630 | 1240 | 1520 | 1180 | 1440 | 1140 | 1370 |
| | | F | 4.9+ 19.5R | 4.4+ 7.0R | 4.3+ 16.1R | 4.0+ 5.8R | 4.2+ 13.8R | 3.9+ 5.0R | 4.0+ 12.1R | 3.8+ 4.3R | 3.9+ 10.7R | 3.8+ 3.9R | 3.8+ 9.7R | 3.7+ 3.5R |
| | TSW @ 12" c/c | q | 1330 | 1590 | 1280 | 1460 | 1290 | 1420 | 1350 | 1430 | 1420 | 1470 | 1520 | 1540 |
| | | F | 4.5+ 19.5R | 4.1+ 7.0R | 4.3+ 16.2R | 4.1+ 5.8R | 4.4+ 13.9R | 4.3+ 5.0R | 4.3+ 12.2R | 4.5+ 4.4R | 4.3+ 10.8R | 4.6+ 3.9R | 4.2+ 9.7R | 4.6+ 3.5R |
| | SSW @ 12" c/c | q | 2150 | 2420 | 2020 | 2410 | 1930 | 2270 | 1860 | 2180 | 1810 | 2110 | 1780 | 2060 |
| | | F | 3.8+ 19.5R | 3.7+ 7.0R | 3.6+ 16.1R | 3.4+ 5.8R | 3.5+ 13.8R | 3.3+ 5.0R | 3.3+ 12.1R | 3.2+ 4.3R | 3.2+ 10.7R | 3.2+ 3.9R | 3.1+ 9.7R | 3.1+ 3.5R |

WELD PATTERN TO SUPPORTS

4 7




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 355 - FIRST FLOOR PLAN

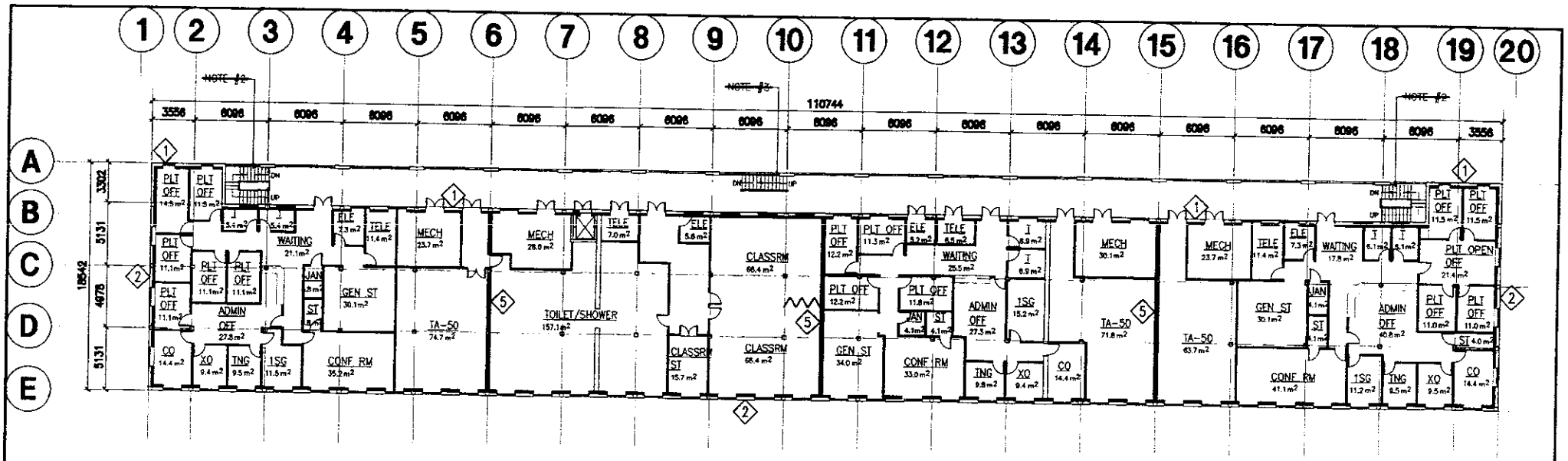
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 1

B018




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 355 - SECOND FLOOR PLAN

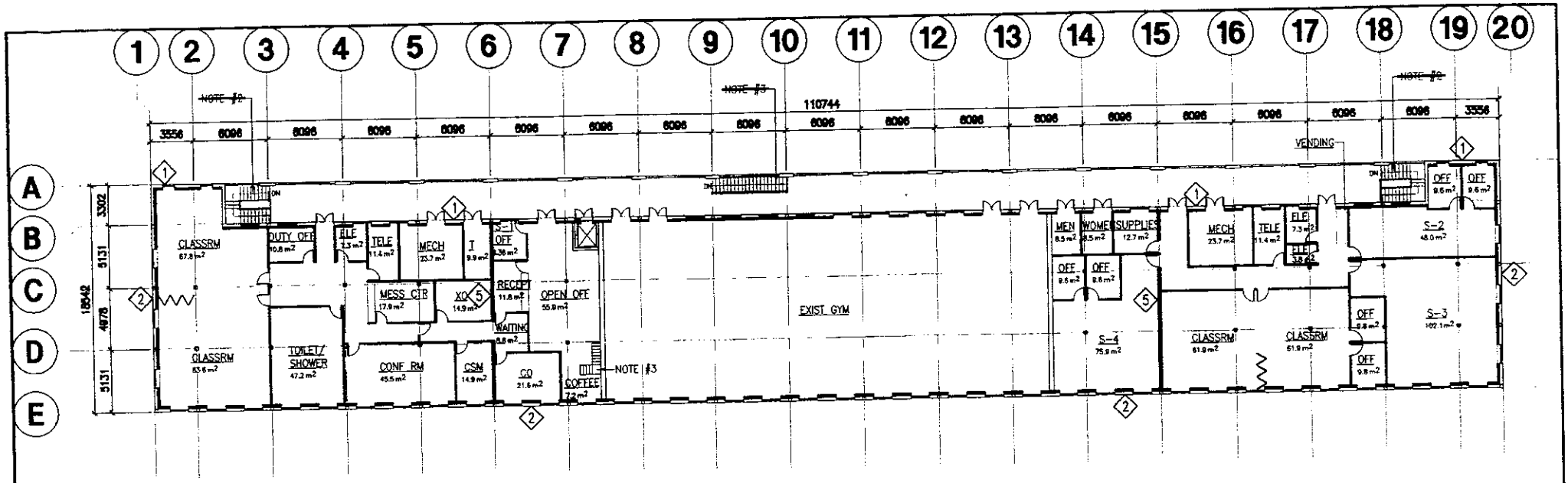
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 2

B017




## BUILDING 355 - THIRD FLOOR PLAN

### SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 355, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 3

PROJ: QUAD C, BUILDING 355
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:23 PM P.M.

V = C1*C2*C3*Sa*W
T=Ct*(hn)^3/4

Sxs=2/3*Fa*Ss
Sx1=2/3*Fv*S1
T0=(Sx1*Bs/Sxs*B1)

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER, Ss = 0.60
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC, S1 = 0.17

| | | | |
|---|---|---|---|
| PERFORMANCE LEVEL [IO,SE,LS,CP] = | IO | Bs = | 1.00 |
| SOIL CLASS [A, B, C, D, E, F] = | E | B1 = | 1.00 |
| % DAMPING = | 5.000 | T0 = | 0.62 |
| SITE COEFFICIENT, Fa = | 1.5 | C1 = | 1.28 |
| SITE COEFFICIENT, Fv = | 3.3 | C2 = | 1.00 |
| Ct FACTOR [0.035,0.030,0.020,0.060] = | 0.020 | C3 = | 1.00 |

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER, Sxs = 0.60
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC, Sx1 = 0.37

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T), Sa = 0.60

TOTAL BUILDING HEIGHT = 41.66 FT
BUILDING SEISMIC WEIGHT, W = 9769 KIPS

| | T (SEC) | k | BASE V (KIPS) |
|---|---|---|---|
| LINEAR STATIC METHOD | 0.33 | 1.00 | 7510.89 |

BASE SHEAR COEFFICIENT = 0.7688 x W
TOTAL DESIGN BASE SHEAR = 7510.9 KIPS

| Ct | LATERAL SYSTEM | %damping | Bs | B1 |
|---|---|---|---|---|
| 0.035 | Steel Moment Resisting Frames | 2.00 | 0.80 | 0.80 |
| 0.030 | RC Moment Resisting Frames | 5.00 | 1.00 | 1.00 |
| 0.030 | Eccentrically Braced Frames | 10.00 | 1.20 | 1.20 |
| 0.020 | All Oher Buildings | | | |
| 0.060 | Wood Buildings | | | |

PROJ: QUAD C, BUILDING 355 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:23 PM P.M.

| CLASS | SITE DESCRIPTION - SOIL PROFILES |
|---|---|
| A | HARD ROCK, SHEAR WAVE VELOCITY Vs > 5000 FT/S. |
| B | ROCK, SHEAR WAVE VELOCITY Vs FROM 2500 TO 5000 FT/S. |
| C | VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY Vs FROM 1200 TO 2500 FT/S. |
| D | STIFF SOIL, SHEAR WAVE VELOCITY Vs FROM 600 TO 1200 FT/S. |
| E | SOFT SOIL, SHEAR WAVE VELOCITY Vs < 600 FT/S. (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.) |
| F | SOIL REQUIRING SITE-SPECIFIC EVALUATION. |

SITE COEFFICIENT, Fa (Based on Site Class & Spectral Response Acceleration Ss)

| | SPECTRAL RESPONSE ACCELERATION, Ss | | | | |
|---|---|---|---|---|---|
| CLASS | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.20 | 1.20 | 1.10 | 1.00 | 1.00 |
| D | 1.60 | 1.40 | 1.20 | 1.10 | 1.00 |
| E | 2.50 | 1.70 | 1.20 | 0.90 | NA |
| F | NA | NA | NA | NA | NA |

SITE COEFFICIENT, Fv (Based on Site Class & Spectral Response Acceleration S1)

| | SPECTRAL RESPONSE ACCELERATION, S1 | | | | |
|---|---|---|---|---|---|
| CLASS | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 |
| D | 2.40 | 2.00 | 1.80 | 1.60 | 1.50 |
| E | 3.50 | 3.20 | 2.80 | 2.40 | NA |
| F | NA | NA | NA | NA | NA |

PROJ: QUAD C, BUILDING 355
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:23 PM P.M.

INCH-POUND UNITS:

| LEVEL | WEIGHT (kips) | DH (ft) | HEIGHT (ft) | W*H/1000 (ft-k) | FORCE (kips) | SHEAR (kips) | V*DH (ft-k) | MOMENT (ft-k) |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| ROOF | 1845 | | 41.7 | 77 | 2576.1 | | | 0 |
| | | 16.5 | | | | 2576.1 | 42506 | |
| 3RD | 3780 | | 25.2 | 95 | 3187.5 | | | 42506 |
| | | 12.6 | | | | 5763.7 | 72507 | |
| 2ND | 4144 | | 12.6 | 52 | 1747.2 | | | 115013 |
| | | 12.6 | | | | 7510.9 | 94487 | |
| GRND | | | | 0 | 0.0 | | | 209500 |
| | 9769 | 41.7 | | 224 | 7510.9 | | 209500 | |

B024



PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03
TITLE: ROOF TIME: 11:34 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | ROOF | 0.018 | 25054 | 438.45 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | | | 438.45 |

| BEAMS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| GRID B | 8.00 | 10.00 | 0.083 | 364.00 | 1.00 | 30.33 |
| GRID C | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID D | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID E | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| TRANS | 10.00 | 10.00 | 0.104 | 60.83 | 19.00 | 120.39 |
| TRANS-C to D | 12.50 | 12.50 | 0.163 | 60.83 | 19.00 | 188.11 |
| GRID 1, 20 | 6.50 | 70.00 | 0.474 | 50.00 | 2.00 | 47.40 |
| | | | | | | 807.11 |

| COLUMNS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 87.70 |

| WALLS: (ROOF) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.18 | 150.00 | 0.090 | 364.00 | 5.58 | 182.29 |
| GRID E | 8.93 | 150.00 | 0.112 | 364.00 | 5.58 | 226.72 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 5.58 | 19.44 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 20 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 5.58 | 0.00 |
| | | | | | | 512.15 |

| | | |
|---|---|---|
| FLOORS | 438.45 | kips |
| BEAMS | 807.11 | kips |
| COLUMNS | 87.70 | kips |
| WALLS | 512.15 | kips |
| | 1845.41 | kips |

B025



PROJECT: QUAD C, BUILDING 355 (w/ retrofit)
TITLE: 3RD FL

DATE: 02/03/03
TIME: 11:34 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | | | | | | 149.06 |

| WALLS: (3RD FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.18 | 150.00 | 0.090 | 364.00 | 5.58 | 182.29 |
| GRID E | 8.93 | 150.00 | 0.112 | 364.00 | 5.58 | 226.72 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 5.58 | 19.44 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 20 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 8.62 | 150.00 | 0.108 | 364.00 | 6.04 | 236.89 |
| GRID E | 10.42 | 150.00 | 0.130 | 364.00 | 6.04 | 286.36 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 20 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 10.5 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 15 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1252.75 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 149.06 | kips |
| WALLS | 1252.75 | kips |
| | 3779.50 | kips |

B026



PROJECT: QUAD C, BUILDING 355 (w/ retrofit)
TITLE: 2ND FL

DATE: 02/03/03
TIME: 11:34 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 122.73 |

| WALLS: (2ND FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 8.62 | 150.00 | 0.108 | 364.00 | 6.04 | 236.89 |
| GRID E | 10.42 | 150.00 | 0.130 | 364.00 | 6.04 | 286.36 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 20 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 10.5 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 15 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 7.95 | 150.00 | 0.099 | 364.00 | 6.04 | 218.48 |
| GRID E | 13.17 | 150.00 | 0.165 | 364.00 | 6.04 | 361.94 |
| GRID A | 8.00 | 150.00 | 0.100 | 34.83 | 6.04 | 21.04 |
| GRID 1 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 20 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 10 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 11 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 15 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1644.05 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 122.73 | kips |
| WALLS | 1644.05 | kips |
| | 4144.48 | kips |

# CENTER OF MASS DETERMINATION



PROJECT: QUAD C, BUILDING 355 (w/ retrofit)
TITLE: ROOF

DATE: 02/03/03
TIME: 11:34 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | ROOF | 438.45 | 182.00 | 30.42 | 79797 | 13335 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 79797 | 13335 |

| BEAMS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 172.52 | 182.00 | 60.42 | 31399 | 10424 |
| | GRID B | 30.33 | 182.00 | 49.58 | 5521 | 1504 |
| | GRID C | 37.92 | 182.00 | 33.17 | 6901 | 1258 |
| | GRID D | 37.92 | 182.00 | 16.83 | 6901 | 638 |
| | GRID E | 172.52 | 182.00 | 0.42 | 31399 | 72 |
| | TRANS | 120.39 | 182.00 | 30.42 | 21911 | 3662 |
| | TRANS-C to D | 188.11 | 182.00 | 25.00 | 34237 | 4703 |
| | GRID 1, 20 | 47.40 | 182.00 | 30.42 | 8626 | 1442 |
| | | | | | 146894 | 23703 |

| COLUMNS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 15961 | 2983 |

| WALLS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 182.29 | 182.00 | 49.67 | 33177 | 9054 |
| | GRID E | 226.72 | 182.00 | 0.33 | 41264 | 75 |
| | GRID A | 19.44 | 182.00 | 60.50 | 3537 | 1176 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 20 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 93212 | 12398 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 79797 | 13335 |
| BEAMS | 146894 | 23703 |
| COLUMNS | 15961 | 2983 |
| WALLS | 93212 | 12398 |
| | 335864.35 | 52418.95 |

CENTER OF MASS X = 182.00
CENTER OF MASS Y = 28.41

PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:34 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | | | | 27130 | 5250 |

| WALLS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 182.29 | 182.00 | 49.67 | 33177 | 9054 |
| | GRID E | 226.72 | 182.00 | 0.33 | 41264 | 75 |
| | GRID A | 19.44 | 182.00 | 60.50 | 3537 | 1176 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 20 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 236.89 | 182.00 | 49.67 | 43115 | 11767 |
| | GRID E | 286.36 | 182.00 | 0.33 | 52118 | 94 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 20 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 10.5 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 15 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 228000 | 30439 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 27130 | 5250 |
| WALLS | 228000 | 30439 |
| | 686866.69 | 108026.13 |

CENTER OF MASS X = 181.73
CENTER OF MASS Y = 28.58

Total center of mass X = 181.82
Total center of mass Y = 28.52

B029



PROJECT: QUAD C, BUILDING 355 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:34 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 22337 | 4533 |

| WALLS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 236.89 | 182.00 | 49.67 | 43115 | 11767 |
| | GRID E | 286.36 | 182.00 | 0.33 | 52118 | 94 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 20 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 10.5 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 15 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 218.48 | 182.00 | 49.67 | 39764 | 10852 |
| | GRID E | 361.94 | 182.00 | 0.33 | 65873 | 119 |
| | GRID A | 21.04 | 182.00 | 60.50 | 3829 | 1273 |
| | GRID 1 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 20 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 10 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 11 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 15 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 299217 | 37836 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 22337 | 4533 |
| WALLS | 299217 | 37836 |
| | 753291.52 | 114706.25 |

CENTER OF MASS X = 181.76
CENTER OF MASS Y = 27.68

Total center of mass X = 181.79
Total center of mass Y = 28.16

B030

**Title :** QUAD C **Job #**

**Dsgnr:** **Date:**

**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 355 -- 2ND FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 7,511.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.79 ft |
| X-X Axis Shear | 7,511.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.16 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.860 | 153.000 | 12.580 | 76.500 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 10.220 | 153.000 | 12.580 | 76.500 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 12.980 | 60.830 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 12.980 | 60.830 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 7.130 | 50.000 | 12.580 | 91.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 16.000 | 50.000 | 12.580 | 171.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 16.000 | 50.000 | 12.580 | 191.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 8 | 8.000 | 50.000 | 12.580 | 271.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 9 | 5.860 | 153.000 | 12.580 | 286.830 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 10 | 10.220 | 153.000 | 12.580 | 286.830 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 11 | 10.590 | 20.000 | 12.580 | 10.000 | 60.830 | 0.0 | Fix-Fix | 1.0 |
| 12 | 9.100 | 20.000 | 12.580 | 353.330 | 60.830 | 0.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 10.140 | 1,259.818 | 32.064 | 1,291.882 |
| 2 | 10.140 | 2,197.156 | -40.699 | 2,197.156 |
| 3 | -18.980 | 1,494.774 | 329.055 | 1,823.830 |
| 4 | 17.353 | 1,494.774 | 297.744 | 1,792.518 |
| 5 | -18.980 | 669.779 | 73.424 | 743.203 |
| 6 | -18.980 | 1,503.009 | 19.811 | 1,522.821 |
| 7 | 17.353 | 1,503.009 | 15.019 | 1,518.028 |
| 8 | 17.353 | 751.505 | 73.772 | 825.277 |
| 9 | 10.140 | 1,259.818 | 32.064 | 1,291.882 |
| 10 | 10.140 | 2,197.156 | -40.699 | 2,197.156 |
| 11 | 10.140 | 259.483 | 9.076 | 268.559 |
| 12 | 10.140 | 222.974 | 7.799 | 230.773 |

## Summary

| | | | | |
|---|---|---|---|---|
| X Distance to Center of Rigidity | 182.604 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | |
| Y Distance to Center of Rigidity | 21.062 ft | Xcm + .05*Max-X - X-cr = | 17.353 ft | Torsion = 130335.93 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.980 ft | Torsion = -142561.23 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 10.140 ft | Torsion = 76,159.97 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 4.057 ft | Torsion = 30,470.56 k-ft |

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 355 -- 3RD FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 5,764.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.82 ft |
| X-X Axis Shear | 5,764.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.52 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 4.380 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 6.560 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 9.880 | 60.830 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 9.880 | 60.830 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 7.500 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 8.000 | 50.000 | 12.580 | 181.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 8.000 | 50.000 | 12.580 | 271.670 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 8 | 7.150 | 20.000 | 12.580 | 10.000 | 60.830 | 0.0 | Fix-Fix | 1.0 |
| 9 | 7.150 | 20.000 | 12.580 | 353.330 | 60.830 | 0.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 9.126 | 2,160.614 | 47.996 | 2,208.611 |
| 2 | 9.126 | 3,235.989 | -58.511 | 3,235.989 |
| 3 | -18.809 | 1,452.245 | 243.475 | 1,695.719 |
| 4 | 17.524 | 1,452.245 | 224.867 | 1,677.111 |
| 5 | -18.809 | 899.259 | 75.780 | 975.039 |
| 6 | -18.809 | 959.210 | 0.698 | 959.908 |
| 7 | 17.524 | 959.210 | 73.256 | 1,032.465 |
| 8 | 9.126 | 168.923 | 5.227 | 174.150 |
| 9 | 9.126 | 168.923 | 5.227 | 174.150 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 182.462 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 22.436 ft | Xcm + .05*Max-X - X-cr = | 17.524 ft | Torsion = | 101010.17 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.809 ft | Torsion = | -108413.24 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 9.126 ft | Torsion = | 52,599.82 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 3.043 ft | Torsion = | 17,537.41 k-ft |

B032

Title : QUAD C
Job #
Dsgnr:
Date:
Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 355 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 0.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 182.00 ft |
| X-X Axis Shear | 2,576.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.41 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 3.660 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 5.630 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Pin | 1.0 |
| 3 | 8.600 | 60.830 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 8.600 | 60.830 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 0.500 | 20.000 | 12.580 | 15.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 0.500 | 20.000 | 12.580 | 35.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 0.500 | 20.000 | 12.580 | 55.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 8 | 0.500 | 20.000 | 12.580 | 75.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 9 | 0.500 | 20.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 10 | 0.500 | 20.000 | 12.580 | 106.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 11 | 0.500 | 20.000 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 12 | 0.500 | 20.000 | 12.580 | 146.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 13 | 0.500 | 20.000 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 14 | 0.500 | 20.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 15 | 0.500 | 20.000 | 12.580 | 197.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 16 | 0.500 | 20.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 17 | 0.500 | 20.000 | 12.580 | 237.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 18 | 0.500 | 20.000 | 12.580 | 257.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 19 | 0.500 | 20.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 20 | 0.500 | 20.000 | 12.580 | 287.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 21 | 0.500 | 20.000 | 12.580 | 307.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 22 | 0.500 | 20.000 | 12.580 | 327.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 23 | 0.500 | 20.000 | 12.580 | 347.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 24 | 6.690 | 20.000 | 12.580 | 10.000 | 60.830 | 0.0 | Fix-Pin | 1.0 |
| 25 | 6.690 | 20.000 | 12.580 | 353.330 | 60.830 | 0.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 9.805 | 966.249 | 26.478 | 992.727 |
| 2 | 9.805 | 1,486.333 | -31.096 | 1,486.333 |
| 3 | 9.805 | 0.814 | 61.985 | 62.799 |
| 4 | 9.805 | 0.814 | 61.984 | 62.798 |
| 5 | 9.805 | 0.000 | 0.730 | 0.730 |
| 6 | 9.805 | 0.000 | 0.642 | 0.642 |
| 7 | 9.805 | 0.000 | 0.554 | 0.554 |
| 8 | 9.805 | 0.000 | 0.466 | 0.466 |
| 9 | 9.805 | 0.000 | 0.400 | 0.400 |
| 10 | 9.805 | 0.000 | 0.331 | 0.331 |
| 11 | 9.805 | 0.000 | 0.243 | 0.243 |

# Rigid Diaphragm Torsional Analysis

**Description** QUAD C, BUILDING 355 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

| | | | | |
|---|---|---|---|---|
| 12 | 9.805 | 0.000 | 0.155 | 0.155 |
| 13 | 9.805 | 0.000 | 0.067 | 0.067 |
| 14 | 9.805 | 0.000 | 0.001 | 0.001 |
| 15 | 9.805 | 0.000 | 0.067 | 0.067 |
| 16 | 9.805 | 0.000 | 0.155 | 0.155 |
| 17 | 9.805 | 0.000 | 0.243 | 0.243 |
| 18 | 9.805 | 0.000 | 0.331 | 0.331 |
| 19 | 9.805 | 0.000 | 0.400 | 0.400 |
| 20 | 9.805 | 0.000 | 0.466 | 0.466 |
| 21 | 9.805 | 0.000 | 0.554 | 0.554 |
| 22 | 9.805 | 0.000 | 0.642 | 0.642 |
| 23 | 9.805 | 0.000 | 0.730 | 0.730 |
| 24 | 9.805 | 60.895 | 2.306 | 63.201 |
| 25 | 9.805 | 60.895 | 2.306 | 63.201 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.667 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 21.647 ft | Xcm + .05*Max-X - X-cr = | 18.499 ft | Torsion = | 0.00 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -17.834 ft | Torsion = | 0.00 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 9.805 ft | Torsion = | 25,257.48 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 3.722 ft | Torsion = | 9,587.67 k-ft |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 08:43 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR FRONT WALL (ONE SIDE OF BREEZEWAY)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 153.00 | 0.082 | 162339 | 0 | 162339 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 153.00 | 0.065 | 204403 | 0 | 204403 | NA |
| PIER (1-3) | FIXED | | | | 0.000 | 0 | 21321 | 21321 | 0.242 |
| PIER (4-6) | FIXED | | | | 0.000 | 0 | 21321 | 21321 | 0.242 |
| PIER 5 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 6 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 7 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 8 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 9 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 10 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 11 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 12 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 13 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER 14 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.031 |
| PIER (15-17) | FIXED | | | | 0.000 | 0 | 17995 | 17995 | 0.204 |

Lremain = 88.00 TOTAL (PIERS ONLY) = 88184 1.000
THKred = 7.95 WALL RIGIDITY = 79317 (K/IN)

WALL PORTION: PIER (1-3)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 25.00 | 0.180 | 73483 | 0 | 73483 | NA |
| PIER 1 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| PIER 2 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| PIER 3 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 10.00 TOTAL (PIERS ONLY) = 34593 1.000
WALL RIGIDITY = 21321 (K/IN)

WALL PORTION: PIER (4-6)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 25.00 | 0.180 | 73483 | 0 | 73483 | NA |
| PIER 4 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| PIER 5 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| PIER 6 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 15.00 TOTAL (PIERS ONLY) = 34593 1.000
WALL RIGIDITY = 21321 (K/IN)

WALL PORTION: PIER (15-17)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 23.00 | 0.435 | 28828 | 0 | 28828 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 23.00 | 0.196 | 67465 | 0 | 67465 | NA |
| PIER 15 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.412 |
| PIER 16 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.412 |
| PIER 17 | FIXED | 12.00 | 4.50 | 3.00 | 1.500 | 4946 | 0 | 4946 | 0.177 |
| | | | Lremain = | 13.00 | TOTAL (PIERS ONLY) = | | | 28008 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 17995 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 5.86 | 12.58 | 153.00 | 0.082 | 79275 | 0 | 79275 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 79275 | (K/IN) |

WALL PORTION: WALL AT FIRE CONTROL

Equiv. Solid Thk = 9.1"

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 20.00 | 0.629 | 18638 | 0 | 18638 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 20.00 | 0.225 | 58411 | 0 | 58411 | NA |
| PIER F1 | FIXED | 12.00 | 4.50 | 3.17 | 1.420 | 5481 | 0 | 5481 | 0.188 |
| PIER F2 | FIXED | 12.00 | 4.50 | 7.00 | 0.643 | 18137 | 0 | 18137 | 0.623 |
| PIER F3 | FIXED | 12.00 | 4.50 | 3.17 | 1.420 | 5481 | 0 | 5481 | 0.188 |
| | | | Lremain = | 13.34 | TOTAL (PIERS ONLY) = | | | 29098 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 14105 | (K/IN) |

WALL PORTION: WALL AT FIRE CONTROL

Equiv. Solid Thk = 10.59"

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 20.00 | 0.629 | 18638 | 0 | 18638 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 20.00 | 0.225 | 58411 | 0 | 58411 | NA |
| PIER C1 | FIXED | 12.00 | 4.50 | 7.75 | 0.581 | 20567 | 0 | 20567 | 0.500 |
| PIER C2 | FIXED | 12.00 | 4.50 | 7.75 | 0.581 | 20567 | 0 | 20567 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 15.50 | TOTAL (PIERS ONLY) = | | | 41134 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 16436 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:27 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1292 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR FRONT WALL (ONE SIDE OF BREEZEWAY)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1292.00 | 12.00 | 1830.00 | 5379.08 | 16253.4 | 0.71 |
| PIER (1-3) | 0.242 | 312.4 | 12.00 | 297.00 | 873.00 | 3123.7 | 0.84 |
| PIER (4-6) | 0.242 | 312.4 | 12.00 | 297.00 | 873.00 | 3123.7 | 0.84 |
| PIER 5 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 6 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 7 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 8 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 9 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 10 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 11 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 12 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 13 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER 14 | 0.031 | 40.4 | 12.00 | 57.00 | 167.55 | 403.6 | 0.57 |
| PIER (15-17) | 0.204 | 263.7 | 12.00 | 273.00 | 802.45 | 2636.5 | 0.77 |
| | | 1292.0 | | | | | |

WALL PORTION: PIER (1-3)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| PIER 2 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| PIER 3 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 312.4 | | | | | |

WALL PORTION: PIER (4-6)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 4 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| PIER 5 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| PIER 6 | 0.333 | 104.1 | 12.00 | 57.00 | 167.55 | 234.28 | 0.33 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 312.4 | | | | | |

WALL PORTION: PIER (15-17)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 15 | 0.412 | 108.5 | 12.00 | 57.00 | 167.55 | 244.23 | 0.34 |
| PIER 16 | 0.412 | 108.5 | 12.00 | 57.00 | 167.55 | 244.23 | 0.34 |
| PIER 17 | 0.177 | 46.6 | 12.00 | 33.00 | 97.00 | 104.75 | 0.26 |
| | 1.000 | 263.7 | | | | | |

WALL PORTION: WALL AT FIRE CONTROL TOTAL WALL SHEAR = 268.6 KIPS

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER F1 | 0.188 | 50.6 | 12.00 | 35.04 | 103.00 | 113.83 | 0.26 |
| PIER F2 | 0.623 | 167.4 | 12.00 | 81.00 | 238.09 | 376.68 | 0.37 |
| PIER F3 | 0.188 | 50.6 | 12.00 | 35.04 | 103.00 | 113.83 | 0.26 |
| | | 268.6 | | | | | |

WALL PORTION: WALL AT FIRE CONTROL TOTAL WALL SHEAR = 230.8 KIPS

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER C1 | 0.500 | 115.4 | 12.00 | 90.00 | 264.54 | 259.65 | 0.23 |
| PIER C2 | 0.500 | 115.4 | 12.00 | 90.00 | 264.54 | 259.65 | 0.23 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 230.8 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 08:35 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-3) | FIXED | | | | 0.000 | 0 | 15714 | 15714 | 0.103 |
| PIER (4-6) | FIXED | | | | 0.000 | 0 | 15714 | 15714 | 0.103 |
| PIER 7 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER (8-9) | FIXED | | | | 0.000 | 0 | 9893 | 9893 | 0.065 |
| PIER 10 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER 11 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER 12 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER (13-19) | FIXED | | | | 0.000 | 0 | 37947 | 37947 | 0.249 |
| PIER 20 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER 21 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER (22-23) | FIXED | | | | 0.000 | 0 | 9893 | 9893 | 0.065 |
| PIER 24 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER (25-26) | FIXED | | | | 0.000 | 0 | 9893 | 9893 | 0.065 |
| PIER 27 | FIXED | 12.00 | 10.00 | 5.00 | 2.000 | 2755 | 0 | 2755 | 0.018 |
| PIER (28-30) | FIXED | | | | 0.000 | 0 | 15714 | 15714 | 0.103 |
| PIER (31-33) | FIXED | | | | 0.000 | 0 | 15714 | 15714 | 0.103 |
| | | | Lremain = | 165.00 | TOTAL (PIERS ONLY) = | | | 152523 | 1.000 |
| | | | THKred = | 8.62 | WALL RIGIDITY = | | | 141090 | (K/IN) |

WALL PORTION: PIER (1-3)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 25.00 | 0.260 | 50249 | 0 | 50249 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 2 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 15714 | (K/IN) |

WALL PORTION: PIER (4-6)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 25.00 | 0.260 | 50249 | 0 | 50249 | NA |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 15714 | (K/IN) |

WALL PORTION: PIER (8-9)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 15.00 | 0.667 | 17321 | 0 | 17321 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 15.00 | 0.433 | 28937 | 0 | 28937 | NA |
| PIER 8 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| PIER 9 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 12837 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 9893 | (K/IN) |

WALL PORTION: PIER (13-19)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 65.00 | 0.154 | 86242 | 0 | 86242 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 65.00 | 0.100 | 133325 | 0 | 133325 | NA |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 16 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 17 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 18 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.143 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 35.00 | TOTAL (PIERS ONLY) = | | | 44929 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 37947 | (K/IN) |

WALL PORTION: PIER (22-23)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 15.00 | 0.667 | 17321 | 0 | 17321 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 15.00 | 0.433 | 28937 | 0 | 28937 | NA |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| PIER 23 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 12837 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 9893 | (K/IN) |

WALL PORTION: PIER (25-26)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 15.00 | 0.667 | 17321 | 0 | 17321 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 15.00 | 0.433 | 28937 | 0 | 28937 | NA |
| PIER 25 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| PIER 26 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 12837 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 9893 | (K/IN) |

WALL PORTION: PIER (28-30)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 25.00 | 0.260 | 50249 | 0 | 50249 | NA |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 15714 | (K/IN) |

WALL PORTION: PIER (31-33)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 25.00 | 0.400 | 31642 | 0 | 31642 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 25.00 | 0.260 | 50249 | 0 | 50249 | NA |
| PIER 31 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 32 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| PIER 33 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.333 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 19255 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 15714 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 4.38 | 12.58 | 363.33 | 0.035 | 140989 | 0 | 140989 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 140989 | (K/IN) |

WALL PORTION: WALL AT OFFICES Equiv. Solid Thk = 7.15"

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 20.00 | 0.629 | 18638 | 0 | 18638 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 20.00 | 0.325 | 39673 | 0 | 39673 | NA |
| PIER C1 | FIXED | 12.00 | 6.50 | 3.17 | 2.050 | 2608 | 0 | 2608 | 0.161 |
| PIER C2 | FIXED | 12.00 | 6.50 | 7.00 | 0.929 | 11017 | 0 | 11017 | 0.679 |
| PIER C3 | FIXED | 12.00 | 6.50 | 3.17 | 2.050 | 2608 | 0 | 2608 | 0.161 |
| | | | Lremain = | 13.34 | TOTAL (PIERS ONLY) = | | | 16234 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 11105 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:52 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2209 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2209.00 | 12.00 | 4353.96 | 12797.98 | 27789.2 | 0.51 |
| PIER (1-3) | 0.103 | 227.6 | 12.00 | 297.00 | 873.00 | 2275.9 | 0.61 |
| PIER (4-6) | 0.103 | 227.6 | 12.00 | 297.00 | 873.00 | 2275.9 | 0.61 |
| PIER 7 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER (8-9) | 0.065 | 143.3 | 12.00 | 177.00 | 520.27 | 1432.9 | 0.65 |
| PIER 10 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER 11 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER 12 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER (13-19) | 0.249 | 549.6 | 12.00 | 777.00 | 2283.90 | 5496.0 | 0.57 |
| PIER 20 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER 21 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER (22-23) | 0.065 | 143.3 | 12.00 | 177.00 | 520.27 | 1432.9 | 0.65 |
| PIER 24 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER (25-26) | 0.065 | 143.3 | 12.00 | 177.00 | 520.27 | 1432.9 | 0.65 |
| PIER 27 | 0.018 | 39.9 | 12.00 | 57.00 | 167.55 | 399.0 | 0.57 |
| PIER (28-30) | 0.103 | 227.6 | 12.00 | 297.00 | 873.00 | 2275.9 | 0.61 |
| PIER (31-33) | 0.103 | 227.6 | 12.00 | 297.00 | 873.00 | 2275.9 | 0.61 |
| | | 2209.0 | | | | | |

WALL PORTION: PIER (1-3)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 2 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 3 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 227.6 | | | | | |

WALL PORTION: PIER (4-6)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 4 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 5 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 6 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 227.6 | | | | | |

WALL PORTION: PIER (8-9)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 8 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| PIER 9 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 143.3 | | | | | |

WALL PORTION: PIER (13-19)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 13 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 14 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 15 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 16 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 17 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 18 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| PIER 19 | 0.143 | 78.5 | 12.00 | 57.00 | 167.55 | 255.17 | 0.36 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 549.6 | | | | | |

WALL PORTION: PIER (22-23)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 22 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| PIER 23 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 143.3 | | | | | |

WALL PORTION: PIER (25-26)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 25 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| PIER 26 | 0.500 | 71.6 | 12.00 | 57.00 | 167.55 | 232.84 | 0.33 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 143.3 | | | | | |

WALL PORTION: PIER (28-30)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 28 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 29 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 30 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| | 1.000 | 227.6 | | | | | |

WALL PORTION: PIER (31-33)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 31 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 32 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| PIER 33 | 0.333 | 75.9 | 12.00 | 57.00 | 167.55 | 246.56 | 0.35 |
| | 1.000 | 227.6 | | | | | |

WALL PORTION: WALL AT OFFICES TOTAL WALL SHEAR = 174.2 KIPS

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER C1 | 0.161 | 28.0 | 12.00 | 35.04 | 103.00 | 90.97 | 0.21 |
| PIER C2 | 0.679 | 118.2 | 12.00 | 81.00 | 238.09 | 384.21 | 0.38 |
| PIER C3 | 0.161 | 28.0 | 12.00 | 35.04 | 103.00 | 90.97 | 0.21 |
| | | 174.2 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 08:38 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.00 | 12.58 | 363.33 | 0.035 | 321481 | 0 | 321481 | NA |
| SOLID STRIP | FIXED | 10.00 | 10.00 | 363.33 | 0.028 | 405006 | 0 | 405006 | NA |
| PIER (1-3) | FIXED | | | | 0.000 | 0 | 13095 | 13095 | 0.103 |
| PIER (4-6) | FIXED | | | | 0.000 | 0 | 13095 | 13095 | 0.103 |
| PIER 7 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER (8-9) | FIXED | | | | 0.000 | 0 | 8245 | 8245 | 0.065 |
| PIER 10 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER 11 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER 12 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER (13-19) | FIXED | | | | 0.000 | 0 | 31623 | 31623 | 0.249 |
| PIER 20 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER 21 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER (22-23) | FIXED | | | | 0.000 | 0 | 8245 | 8245 | 0.065 |
| PIER 24 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER (25-26) | FIXED | | | | 0.000 | 0 | 8245 | 8245 | 0.065 |
| PIER 27 | FIXED | 10.00 | 10.00 | 5.00 | 2.000 | 2296 | 0 | 2296 | 0.018 |
| PIER (28-30) | FIXED | | | | 0.000 | 0 | 13095 | 13095 | 0.103 |
| PIER (31-33) | FIXED | | | | 0.000 | 0 | 13095 | 13095 | 0.103 |
| | | | Lremain = | 165.00 | TOTAL (PIERS ONLY) = | | | 127102 | 1.000 |
| | | | THKred = | 7.18 | WALL RIGIDITY = | | | 117520 | (K/IN) |

WALL PORTION: PIER (1-3)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 25.00 | 0.400 | 26368 | 0 | 26368 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 25.00 | 0.260 | 41874 | 0 | 41874 | NA |
| PIER 1 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 2 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 3 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 16046 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13095 | (K/IN) |

WALL PORTION: PIER (4-6)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 25.00 | 0.400 | 26368 | 0 | 26368 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 25.00 | 0.260 | 41874 | 0 | 41874 | NA |
| PIER 4 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 5 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 6 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 16046 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13095 | (K/IN) |

13045

WALL PORTION: PIER (8-9)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 15.00 | 0.667 | 14434 | 0 | 14434 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 15.00 | 0.433 | 24114 | 0 | 24114 | NA |
| PIER 8 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| PIER 9 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 10697 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 8245 | (K/IN) |

WALL PORTION: PIER (13-19)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 65.00 | 0.154 | 71868 | 0 | 71868 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 65.00 | 0.100 | 111104 | 0 | 111104 | NA |
| PIER 13 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 14 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 15 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 16 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 17 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 18 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| PIER 19 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.143 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 35.00 | TOTAL (PIERS ONLY) = | | | 37441 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 31623 | (K/IN) |

WALL PORTION: PIER (22-23)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 15.00 | 0.667 | 14434 | 0 | 14434 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 15.00 | 0.433 | 24114 | 0 | 24114 | NA |
| PIER 22 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| PIER 23 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 10697 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 8245 | (K/IN) |

WALL PORTION: PIER (25-26)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 15.00 | 0.667 | 14434 | 0 | 14434 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 15.00 | 0.433 | 24114 | 0 | 24114 | NA |
| PIER 25 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| PIER 26 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 10.00 | TOTAL (PIERS ONLY) = | | | 10697 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 8245 | (K/IN) |

WALL PORTION: PIER (28-30)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 25.00 | 0.400 | 26368 | 0 | 26368 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 25.00 | 0.260 | 41874 | 0 | 41874 | NA |
| PIER 28 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 29 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 30 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 16046 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13095 | (K/IN) |

WALL PORTION: PIER (31-33)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 25.00 | 0.400 | 26368 | 0 | 26368 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 25.00 | 0.260 | 41874 | 0 | 41874 | NA |
| PIER 31 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 32 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| PIER 33 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.333 |
| | | | Lremain = | 15.00 | TOTAL (PIERS ONLY) = | | | 16046 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 13095 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 3.66 | 12.58 | 363.33 | 0.035 | 117662 | 0 | 117662 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 117662 | (K/IN) |

WALL PORTION: WALL AT OFFICES ( Equiv. Solid Thk = 6.69 "

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.00 | 12.58 | 20.00 | 0.629 | 11325 | 0 | 11325 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 20.00 | 0.325 | 33061 | 0 | 33061 | NA |
| PIER C1 | FIXED | 10.00 | 6.50 | 3.17 | 2.050 | 2174 | 0 | 2174 | 0.161 |
| PIER C2 | FIXED | 10.00 | 6.50 | 7.00 | 0.929 | 9181 | 0 | 9181 | 0.679 |
| PIER C3 | FIXED | 10.00 | 6.50 | 3.17 | 2.050 | 2174 | 0 | 2174 | 0.161 |
| | | | Lremain = | 13.34 | TOTAL (PIERS ONLY) = | | | 13528 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 7578 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:48 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 993 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 993.00 | 10.00 | 4353.96 | 10664.98 | 12491.9 | 0.23 |
| PIER (1-3) | 0.103 | 102.3 | 10.00 | 297.00 | 727.50 | 1023.1 | 0.28 |
| PIER (4-6) | 0.103 | 102.3 | 10.00 | 297.00 | 727.50 | 1023.1 | 0.28 |
| PIER 7 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER (8-9) | 0.065 | 64.4 | 10.00 | 177.00 | 433.56 | 644.1 | 0.29 |
| PIER 10 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER 11 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER 12 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER (13-19) | 0.249 | 247.1 | 10.00 | 777.00 | 1903.25 | 2470.6 | 0.25 |
| PIER 20 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER 21 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER (22-23) | 0.065 | 64.4 | 10.00 | 177.00 | 433.56 | 644.1 | 0.29 |
| PIER 24 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER (25-26) | 0.065 | 64.4 | 10.00 | 177.00 | 433.56 | 644.1 | 0.29 |
| PIER 27 | 0.018 | 17.9 | 10.00 | 57.00 | 139.62 | 179.3 | 0.25 |
| PIER (28-30) | 0.103 | 102.3 | 10.00 | 297.00 | 727.50 | 1023.1 | 0.28 |
| PIER (31-33) | 0.103 | 102.3 | 10.00 | 297.00 | 727.50 | 1023.1 | 0.28 |
| | | 993.0 | | | | | |

WALL PORTION: PIER (1-3)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 2 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 3 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 102.3 | | | | | |

WALL PORTION: PIER (4-6)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 4 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 5 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 6 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 102.3 | | | | | |

WALL PORTION: PIER (8-9)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 8 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| PIER 9 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 64.4 | | | | | |

WALL PORTION: PIER (13-19)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 13 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 14 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 15 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 16 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 17 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 18 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| PIER 19 | 0.143 | 35.3 | 10.00 | 57.00 | 139.62 | 114.70 | 0.16 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 247.1 | | | | | |

WALL PORTION: PIER (22-23)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 22 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| PIER 23 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 64.4 | | | | | |

WALL PORTION: PIER (25-26)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 25 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| PIER 26 | 0.500 | 32.2 | 10.00 | 57.00 | 139.62 | 104.67 | 0.15 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 64.4 | | | | | |

WALL PORTION: PIER (28-30)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 28 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 29 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 30 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| | 1.000 | 102.3 | | | | | |

WALL PORTION: PIER (31-33)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 31 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 32 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| PIER 33 | 0.333 | 34.1 | 10.00 | 57.00 | 139.62 | 110.83 | 0.16 |
| | 1.000 | 102.3 | | | | | |

WALL PORTION: WALL AT OFFICES TOTAL WALL SHEAR = 63.2 KIPS

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER C1 | 0.161 | 10.2 | 10.00 | 35.04 | 85.83 | 33.00 | 0.08 |
| PIER C2 | 0.679 | 42.9 | 10.00 | 81.00 | 198.41 | 139.39 | 0.14 |
| PIER C3 | 0.161 | 10.2 | 10.00 | 35.04 | 85.83 | 33.00 | 0.08 |
| | 1.000 | 63.2 | | | | | |

B050

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 08:59 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL (ONE SIDE OF BREEZEWAY)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 172.17 | 0.073 | 243695 | 0 | 243695 | NA |
| SOLID STRIP | FIXED | 16.00 | 4.50 | 172.17 | 0.026 | 682396 | 0 | 682396 | NA |
| PIER 1 | FIXED | 16.00 | 4.50 | 4.17 | 1.079 | 11676 | 0 | 11676 | 0.044 |
| PIER 2 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 3 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 4 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 5 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 6 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 7 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 8 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 9 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 10 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 11 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 12 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 13 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 14 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 15 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 16 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 17 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.058 |
| PIER 18 | FIXED | 16.00 | 4.50 | 3.00 | 1.500 | 6594 | 0 | 6594 | 0.025 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 87.17
THKred = 13.17

TOTAL (PIERS ONLY) = 264265 1.000
WALL RIGIDITY = 155711 (K/IN)

B051

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.22 | 12.58 | 172.17 | 0.073 | 155660 | 0 | 155660 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 155660 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:32 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2197 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR BACK WALL (ONE SIDE OF BREEZEWAY)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2197.00 | 16.00 | 2060.04 | 8073.67 | 27638.3 | 1.07 |
| PIER 1 | 0.044 | 97.1 | 16.00 | 47.04 | 184.36 | 436.8 | 0.75 |
| PIER 2 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 3 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 4 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 5 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 6 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 7 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 8 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 9 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 10 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 11 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 12 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 13 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 14 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 15 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 16 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 17 | 0.058 | 127.8 | 16.00 | 57.00 | 223.39 | 575.2 | 0.82 |
| PIER 18 | 0.025 | 54.8 | 16.00 | 33.00 | 129.33 | 246.7 | 0.61 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 2197.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:29 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 363.33 | 0.035 | 450651 | 0 | 450651 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 363.33 | 0.018 | 872456 | 0 | 872456 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 4.17 | 1.559 | 5362 | 0 | 5362 | 0.020 |
| PIER 2 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 3 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 4 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 5 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 6 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 7 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 8 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 9 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 10 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 11 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 12 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 13 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 14 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 15 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 16 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 17 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 18 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 19 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 20 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 21 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 22 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 23 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 24 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 25 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 26 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 27 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 28 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 29 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 30 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 31 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 32 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 33 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 34 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 35 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 36 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.027 |
| PIER 37 | FIXED | 14.00 | 6.50 | 4.17 | 1.559 | 5362 | 0 | 5362 | 0.020 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 183.34
THKred = 10.42

TOTAL (PIERS ONLY) = 272808 1.000
WALL RIGIDITY = 211042 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.56 | 12.58 | 363.33 | 0.035 | 211162 | 0 | 211162 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 211162 | (K/IN) |

B055

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:12 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3236 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3236.00 | 14.00 | 4353.96 | 14930.97 | 40708.9 | 0.75 |
| PIER 1 | 0.020 | 63.6 | 14.00 | 47.04 | 161.31 | 206.7 | 0.35 |
| PIER 2 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 3 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 4 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 5 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 6 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 7 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 8 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 9 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 10 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 11 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 12 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 13 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 14 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 15 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 16 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 17 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 18 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 19 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 20 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 21 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 22 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 23 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 24 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 25 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 26 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 27 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 28 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 29 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 30 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 31 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 32 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 33 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 34 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 35 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 36 | 0.027 | 88.8 | 14.00 | 57.00 | 195.47 | 288.7 | 0.41 |
| PIER 37 | 0.020 | 63.6 | 14.00 | 47.04 | 161.31 | 206.7 | 0.35 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 3236.0 | | | | | |

B056

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:32 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 363.33 | 0.035 | 385777 | 0 | 385777 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 363.33 | 0.018 | 747820 | 0 | 747820 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 4.17 | 1.559 | 4596 | 0 | 4596 | 0.020 |
| PIER 2 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 8 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 9 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 10 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 16 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 17 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 18 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 23 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 24 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 25 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 26 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 31 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 32 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 33 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 34 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 35 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 36 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.027 |
| PIER 37 | FIXED | 12.00 | 6.50 | 4.17 | 1.559 | 4596 | 0 | 4596 | 0.020 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 183.34
THKred = 8.93

TOTAL (PIERS ONLY) = 233836 1.000
WALL RIGIDITY = 180784 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 5.63 | 12.58 | 363.33 | 0.035 | 180994 | 0 | 180994 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 180994 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:57 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1486 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1486.00 | 12.00 | 4353.96 | 12797.98 | 18693.9 | 0.34 |
| PIER 1 | 0.020 | 29.2 | 12.00 | 47.04 | 138.27 | 94.9 | 0.16 |
| PIER 2 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 3 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 4 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 5 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 6 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 7 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 8 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 9 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 10 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 11 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 12 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 13 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 14 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 15 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 16 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 17 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 18 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 19 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 20 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 21 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 22 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 23 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 24 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 25 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 26 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 27 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 28 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 29 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 30 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 31 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 32 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 33 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 34 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 35 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 36 | 0.027 | 40.8 | 12.00 | 57.00 | 167.55 | 132.6 | 0.19 |
| PIER 37 | 0.020 | 29.2 | 12.00 | 47.04 | 138.27 | 94.9 | 0.16 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 1486.0 | | | | | |

B059

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:08 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 60.83 | 0.207 | 84967 | 0 | 84967 | NA |
| SOLID STRIP | FIXED | 16.00 | 4.50 | 60.83 | 0.074 | 240688 | 0 | 240688 | NA |
| PIER 1 | FIXED | 16.00 | 4.50 | 6.50 | 0.692 | 22003 | 0 | 22003 | 0.152 |
| PIER 2 | FIXED | 16.00 | 4.50 | 11.00 | 0.409 | 41150 | 0 | 41150 | 0.284 |
| PIER 3 | FIXED | 16.00 | 4.50 | 11.00 | 0.409 | 41150 | 0 | 41150 | 0.284 |
| PIER 4 | FIXED | 16.00 | 4.50 | 9.00 | 0.500 | 32756 | 0 | 32756 | 0.226 |
| PIER 5 | FIXED | 16.00 | 4.50 | 3.33 | 1.351 | 7990 | 0 | 7990 | 0.055 |
| | | | | | TOTAL (PIERS ONLY) = | | | 145048 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 68924 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.98 | 12.58 | 60.83 | 0.207 | 68930 | 0 | 68930 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 68930 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:37 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1824 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1824.00 | 16.00 | 723.96 | 2837.33 | 22945.9 | 2.54 |
| PIER 1 | 0.152 | 276.7 | 16.00 | 75.00 | 293.94 | 622.5 | 0.67 |
| PIER 2 | 0.284 | 517.5 | 16.00 | 129.00 | 505.57 | 1164.3 | 0.73 |
| PIER 3 | 0.284 | 517.5 | 16.00 | 129.00 | 505.57 | 1164.3 | 0.73 |
| PIER 4 | 0.226 | 411.9 | 16.00 | 105.00 | 411.51 | 926.8 | 0.71 |
| PIER 5 | 0.055 | 100.5 | 16.00 | 36.96 | 144.85 | 226.1 | 0.49 |
| | | 1824.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:07 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 60.83 | 0.207 | 74346 | 0 | 74346 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 60.83 | 0.107 | 145493 | 0 | 145493 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 6.50 | 1.000 | 11502 | 0 | 11502 | 0.144 |
| PIER 2 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.293 |
| PIER 3 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.293 |
| PIER 4 | FIXED | 14.00 | 6.50 | 9.00 | 0.722 | 18220 | 0 | 18220 | 0.228 |
| PIER 5 | FIXED | 14.00 | 6.50 | 3.33 | 1.952 | 3388 | 0 | 3388 | 0.042 |
| | | | | | TOTAL (PIERS ONLY) = | | | 80086 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 52455 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.88 | 12.58 | 60.83 | 0.207 | 52467 | 0 | 52467 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 52467 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:18 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1696 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1696.00 | 14.00 | 723.96 | 2482.67 | 21335.7 | 2.36 |
| PIER 1 | 0.144 | 243.6 | 14.00 | 75.00 | 257.20 | 791.7 | 0.85 |
| PIER 2 | 0.293 | 497.4 | 14.00 | 129.00 | 442.38 | 1616.6 | 1.01 |
| PIER 3 | 0.293 | 497.4 | 14.00 | 129.00 | 442.38 | 1616.6 | 1.01 |
| PIER 4 | 0.228 | 385.8 | 14.00 | 105.00 | 360.07 | 1254.0 | 0.96 |
| PIER 5 | 0.042 | 71.7 | 14.00 | 36.96 | 126.75 | 233.2 | 0.51 |
| | | 1696.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:05 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 60.83 | 0.207 | 60973 | 0 | 60973 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 60.83 | 0.107 | 124708 | 0 | 124708 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.50 | 1.000 | 9859 | 0 | 9859 | 0.144 |
| PIER 2 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.293 |
| PIER 3 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.293 |
| PIER 4 | FIXED | 12.00 | 6.50 | 9.00 | 0.722 | 15617 | 0 | 15617 | 0.228 |
| PIER 5 | FIXED | 12.00 | 6.50 | 3.33 | 1.952 | 2904 | 0 | 2904 | 0.042 |
| | | | | | TOTAL (PIERS ONLY) = | | | 68645 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 43574 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.60 | 12.58 | 60.83 | 0.207 | 43698 | 0 | 43698 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 43698 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 11:03 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 62.8 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 62.80 | 12.00 | 723.96 | 2128.00 | 790.0 | 0.09 |
| PIER 1 | 0.144 | 9.0 | 12.00 | 75.00 | 220.45 | 29.3 | 0.03 |
| PIER 2 | 0.293 | 18.4 | 12.00 | 129.00 | 379.18 | 59.9 | 0.04 |
| PIER 3 | 0.293 | 18.4 | 12.00 | 129.00 | 379.18 | 59.9 | 0.04 |
| PIER 4 | 0.228 | 14.3 | 12.00 | 105.00 | 308.64 | 46.4 | 0.04 |
| PIER 5 | 0.042 | 2.7 | 12.00 | 36.96 | 108.64 | 8.6 | 0.02 |
| | | 62.8 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:16 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 34670 | 0 | 34670 | NA |
| SOLID STRIP | FIXED | 8.00 | 7.00 | 50.00 | 0.140 | 63272 | 0 | 63272 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 36.33 | 0.193 | 45689 | 0 | 45689 | 0.882 |
| PIER 2 | FIXED | 8.00 | 7.00 | 6.67 | 1.049 | 6100 | 0 | 6100 | 0.118 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 51789 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 30914 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.13 | 12.58 | 50.00 | 0.252 | 30899 | 0 | 30899 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 30899 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:40 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 743 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 743.00 | 8.00 | 594.00 | 1164.00 | 9346.9 | 1.26 |
| PIER 1 | 0.882 | 655.5 | 8.00 | 432.96 | 848.42 | 4588.4 | 0.85 |
| PIER 2 | 0.118 | 87.5 | 8.00 | 77.04 | 150.97 | 612.6 | 0.64 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 743.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 34670 | 0 | 34670 | NA |
| SOLID STRIP | FIXED | 8.00 | 7.00 | 50.00 | 0.140 | 63272 | 0 | 63272 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 33.50 | 0.209 | 42033 | 0 | 42033 | 0.746 |
| PIER 2 | FIXED | 8.00 | 7.00 | 12.50 | 0.560 | 14324 | 0 | 14324 | 0.254 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 56358 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32486 | (K/IN) |

B069

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.50 | 12.58 | 50.00 | 0.252 | 32503 | 0 | 32503 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 32503 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:26 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 975 KIPS

WALL PORTION: 2ND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 975.00 | 8.00 | 594.00 | 1164.00 | 12265.5 | 1.66 |
| PIER 1 | 0.746 | 727.2 | 8.00 | 399.00 | 781.88 | 5090.3 | 1.02 |
| PIER 2 | 0.254 | 247.8 | 8.00 | 147.00 | 288.06 | 1734.7 | 0.95 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 975.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 01/30/03
TIME: 11:18 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | FIXED | 8.00 | 7.00 | 50.00 | 0.140 | 63272 | 0 | 63272 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 33.50 | 0.209 | 42033 | 0 | 42033 | 0.746 |
| PIER 2 | FIXED | 8.00 | 7.00 | 12.50 | 0.560 | 14324 | 0 | 14324 | 0.254 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 56358 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 30585 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.05 | 12.58 | 50.00 | 0.252 | 30552 | 0 | 30552 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 30552 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:54 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY2 WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 34670 | 0 | 34670 | NA |
| SOLID STRIP | FIXED | 8.00 | 4.50 | 50.00 | 0.090 | 98826 | 0 | 98826 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | ERROR! | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:54 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 825 KIPS

WALL PORTION: GROUND FLOOR HALLWAY2 WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 825.00 | 8.00 | 594.00 | 1164.00 | 10378.5 | 1.40 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 0.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:38 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR HALLWAY3 WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 34670 | 0 | 34670 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 50.00 | 0.130 | 68204 | 0 | 68204 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | ERROR! | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:38 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1032 KIPS

WALL PORTION: 2ND FLOOR HALLWAY3 WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1032.00 | 8.00 | 594.00 | 1164.00 | 12982.6 | 1.76 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 0.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:47 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BREEZEWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 50.00 | 0.252 | 69339 | 0 | 69339 | NA |
| SOLID STRIP | FIXED | 16.00 | 4.50 | 50.00 | 0.090 | 197652 | 0 | 197652 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | ERROR! | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 09:47 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1523 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR BREEZEWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1523.00 | 16.00 | 594.00 | 2328.00 | 19159.3 | 2.59 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 0.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:33 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BREEZEWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.00 | 12.58 | 50.00 | 0.252 | 34670 | 0 | 34670 | NA |
| SOLID STRIP | FIXED | 8.00 | 6.50 | 50.00 | 0.130 | 68204 | 0 | 68204 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | ERROR! | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 355

DATE: 02/04/03
TIME: 10:33 AM

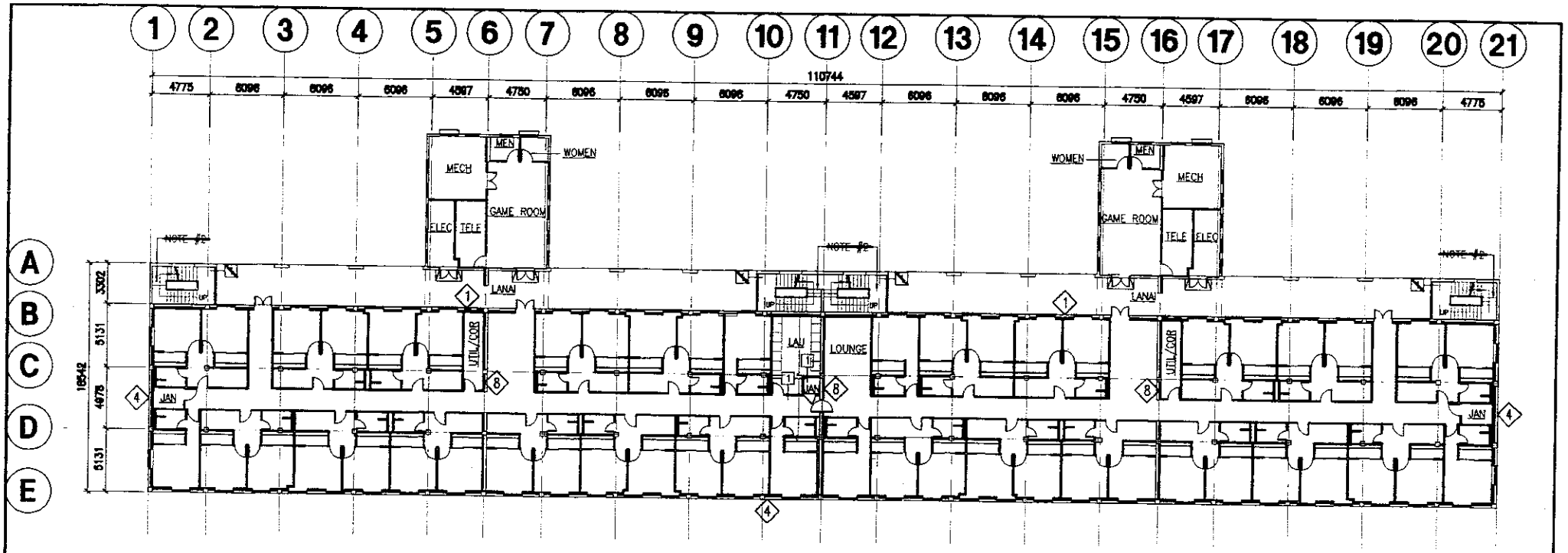
CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 960 KIPS

WALL PORTION: 2ND FLOOR BREEZEWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 960.00 | 8.00 | 594.00 | 1164.00 | 12076.8 | 1.63 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 0.0 | | | | | |




## BUILDING 356 - FIRST FLOOR PLAN

### SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

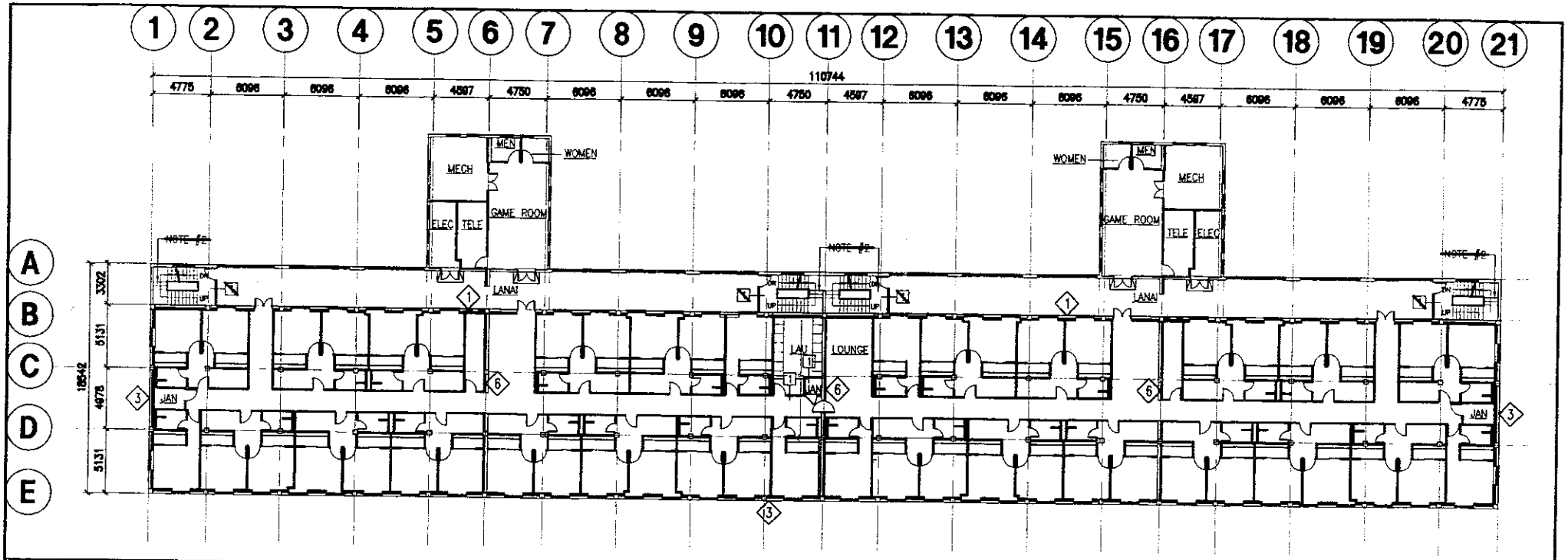
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 4

B081




## BUILDING 356 - SECOND FLOOR PLAN

## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

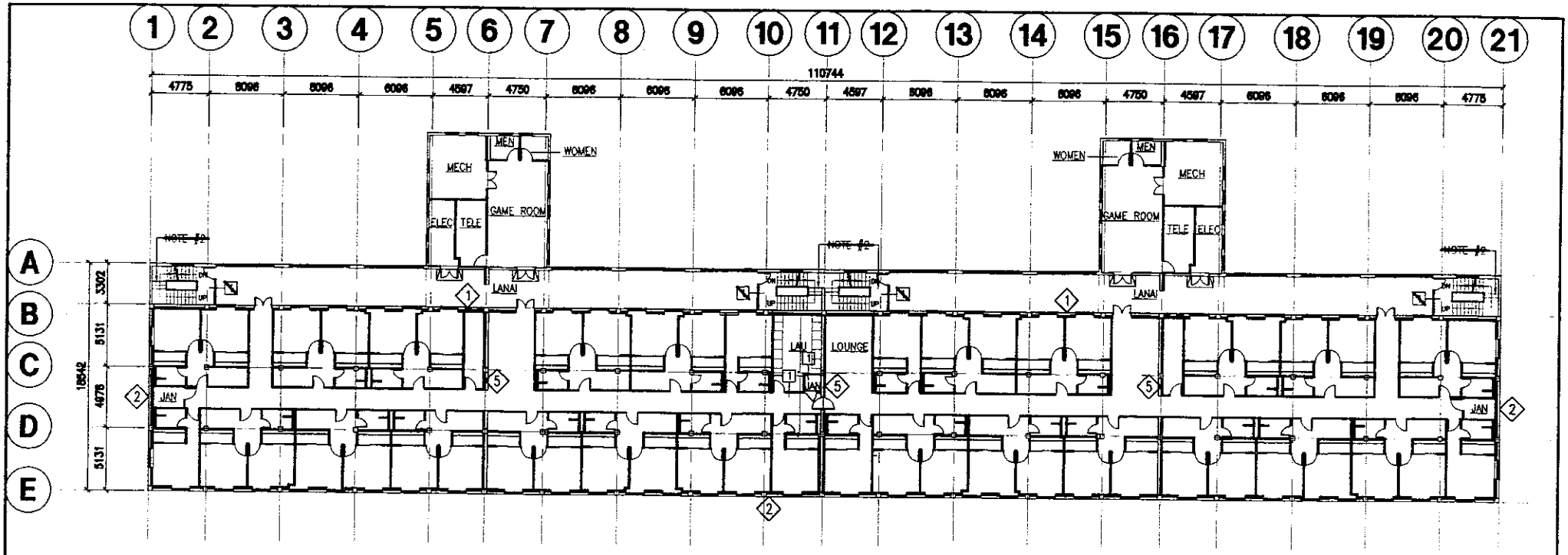
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 5

30 of 2




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 356 - THIRD FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 356, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 6

13085

PROJ: QUAD C, BUILDING 356
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:11 PM P.M.

V = C1*C2*C3*Sa*W
T=Ct*(hn)^3/4

Sxs=2/3*Fa*Ss
Sx1=2/3*Fv*S1
T0=(Sx1*Bs/Sxs*B1)

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER, Ss = 0.60
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC, S1 = 0.17

| | | | |
|---|---|---|---|
| PERFORMANCE LEVEL [IO,SE,LS,CP] = | IO | Bs = | 1.00 |
| SOIL CLASS [A, B, C, D, E, F] = | E | B1 = | 1.00 |
| % DAMPING = | 5.000 | T0 = | 0.62 |
| SITE COEFFICIENT, Fa = | 1.5 | C1 = | 1.28 |
| SITE COEFFICIENT, Fv = | 3.3 | C2 = | 1.00 |
| Ct FACTOR [0.035,0.030,0.020,0.060] = | 0.020 | C3 = | 1.00 |

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER, Sxs = 0.60
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC, Sx1 = 0.37

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T), Sa = 0.60

TOTAL BUILDING HEIGHT = 41.66 FT
BUILDING SEISMIC WEIGHT, W = 10064 KIPS

| | T (SEC) | k | BASE V (KIPS) |
|---|---|---|---|
| LINEAR STATIC METHOD | 0.33 | 1.00 | 7737.70 |

BASE SHEAR COEFFICIENT = 0.7688 x W
TOTAL DESIGN BASE SHEAR = 7737.7 KIPS

| Ct | LATERAL SYSTEM | %damping | Bs | B1 |
|---|---|---|---|---|
| 0.035 | Steel Moment Resisting Frames | 2.00 | 0.80 | 0.80 |
| 0.030 | RC Moment Resisting Frames | 5.00 | 1.00 | 1.00 |
| 0.030 | Eccentrically Braced Frames | 10.00 | 1.20 | 1.20 |
| 0.020 | All Oher Buildings | | | |
| 0.060 | Wood Buildings | | | |

PROJ: QUAD C, BUILDING 356
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:11 PM P.M.

| CLASS | SITE DESCRIPTION - SOIL PROFILES |
|---|---|
| A | HARD ROCK, SHEAR WAVE VELOCITY Vs > 5000 FT/S. |
| B | ROCK, SHEAR WAVE VELOCITY Vs FROM 2500 TO 5000 FT/S. |
| C | VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY Vs FROM 1200 TO 2500 FT/S. |
| D | STIFF SOIL, SHEAR WAVE VELOCITY Vs FROM 600 TO 1200 FT/S. |
| E | SOFT SOIL, SHEAR WAVE VELOCITY Vs < 600 FT/S. (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.) |
| F | SOIL REQUIRING SITE-SPECIFIC EVALUATION. |

SITE COEFFICIENT, Fa (Based on Site Class & Spectral Response Acceleration Ss)

| | SPECTRAL RESPONSE ACCELERATION, Ss | | | | |
|---|---|---|---|---|---|
| CLASS | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.20 | 1.20 | 1.10 | 1.00 | 1.00 |
| D | 1.60 | 1.40 | 1.20 | 1.10 | 1.00 |
| E | 2.50 | 1.70 | 1.20 | 0.90 | NA |
| F | NA | NA | NA | NA | NA |

SITE COEFFICIENT, Fv (Based on Site Class & Spectral Response Acceleration S1)

| | SPECTRAL RESPONSE ACCELERATION, S1 | | | | |
|---|---|---|---|---|---|
| CLASS | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 |
| D | 2.40 | 2.00 | 1.80 | 1.60 | 1.50 |
| E | 3.50 | 3.20 | 2.80 | 2.40 | NA |
| F | NA | NA | NA | NA | NA |

PROJ: QUAD C, BUILDING 356 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:11 PM P.M.

INCH-POUND UNITS:

| LEVEL | WEIGHT (kips) | DH (ft) | HEIGHT (ft) | W*H/1000 (ft-k) | FORCE (kips) | SHEAR (kips) | V*DH (ft-k) | MOMENT (ft-k) |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| ROOF | 1875 | | 41.7 | 78 | 2625.1 | | | 0 |
| | | 16.5 | | | | 2625.1 | 43314 | |
| 3RD | 3904 | | 25.2 | 98 | 3301.0 | | | 43314 |
| | | 12.6 | | | | 5926.1 | 74551 | |
| 2ND | 4285 | | 12.6 | 54 | 1811.6 | | | 117865 |
| | | 12.6 | | | | 7737.7 | 97340 | |
| GRND | | | | 0 | 0.0 | | | 215205 |
| | 10064 | 41.7 | | 230 | 7737.7 | | 215205 | |

B087



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: ROOF TIME: 11:36 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | ROOF | 0.018 | 25054 | 438.45 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | | | 438.45 |

| BEAMS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| GRID B | 8.00 | 10.00 | 0.083 | 364.00 | 1.00 | 30.33 |
| GRID C | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID D | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID E | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| TRANS | 10.00 | 10.00 | 0.104 | 60.83 | 19.00 | 120.39 |
| TRANS-C to D | 12.50 | 12.50 | 0.163 | 60.83 | 19.00 | 188.11 |
| GRID 1, 21 | 6.50 | 70.00 | 0.474 | 50.00 | 2.00 | 47.40 |
| | | | | | | 807.11 |

| COLUMNS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 87.70 |

| WALLS: (ROOF) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 5.58 | 0.00 |
| | | | | | | 541.89 |

| | | |
|---|---|---|
| FLOORS | 438.45 | kips |
| BEAMS | 807.11 | kips |
| COLUMNS | 87.70 | kips |
| WALLS | 541.89 | kips |
| | 1875.15 | kips |

B088



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:36 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | | | | | | 149.06 |

| WALLS: (3RD FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 12.36 | 150.00 | 0.155 | 364.00 | 6.04 | 339.68 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 21 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1377.05 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 149.06 | kips |
| WALLS | 1377.05 | kips |
| | 3903.80 | kips |

B089



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:36 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 122.73 |

| WALLS: (2ND FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 12.36 | 150.00 | 0.155 | 364.00 | 6.04 | 339.68 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 21 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 10.19 | 150.00 | 0.127 | 364.00 | 6.04 | 280.04 |
| GRID E | 15.17 | 150.00 | 0.190 | 364.00 | 6.04 | 416.90 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 18.00 | 150.00 | 0.225 | 50.00 | 6.04 | 67.95 |
| GRID 21 | 18.00 | 150.00 | 0.225 | 50.00 | 6.04 | 67.95 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1784.90 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 122.73 | kips |
| WALLS | 1784.90 | kips |
| | 4285.32 | kips |

B090



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: ROOF TIME: 11:36 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | ROOF | 438.45 | 182.00 | 30.42 | 79797 | 13335 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 79797 | 13335 |

| BEAMS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 172.52 | 182.00 | 60.42 | 31399 | 10424 |
| | GRID B | 30.33 | 182.00 | 49.58 | 5521 | 1504 |
| | GRID C | 37.92 | 182.00 | 33.17 | 6901 | 1258 |
| | GRID D | 37.92 | 182.00 | 16.83 | 6901 | 638 |
| | GRID E | 172.52 | 182.00 | 0.42 | 31399 | 72 |
| | TRANS | 120.39 | 182.00 | 30.42 | 21911 | 3662 |
| | TRANS-C to D | 188.11 | 182.00 | 25.00 | 34237 | 4703 |
| | GRID 1, 21 | 47.40 | 182.00 | 30.42 | 8626 | 1442 |
| | | | | | 146894 | 23703 |

| COLUMNS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 15961 | 2983 |

| WALLS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| | GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| | GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 98624 | 13502 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 79797 | 13335 |
| BEAMS | 146894 | 23703 |
| COLUMNS | 15961 | 2983 |
| WALLS | 98624 | 13502 |
| | 341277.03 | 53522.84 |

CENTER OF MASS X = 182.00
CENTER OF MASS Y = 28.54

B091



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:36 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | | | | 27130 | 5250 |

| WALLS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| | GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| | GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| | GRID E | 339.68 | 182.00 | 0.33 | 61821 | 112 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 21 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 250623 | 33294 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 27130 | 5250 |
| WALLS | 250623 | 33294 |
| | 709489.43 | 110880.73 |

CENTER OF MASS X = 181.74
CENTER OF MASS Y = 28.40

Total center of mass X = 181.83
Total center of mass Y = 28.45

B092



PROJECT: QUAD C, BUILDING 356 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:36 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 22337 | 4533 |

| WALLS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| | GRID E | 339.68 | 182.00 | 0.33 | 61821 | 112 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 21 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 280.04 | 182.00 | 49.67 | 50968 | 13910 |
| | GRID E | 416.90 | 182.00 | 0.33 | 75876 | 138 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 67.95 | 182.00 | 25.00 | 12367 | 1699 |
| | GRID 21 | 67.95 | 182.00 | 25.00 | 12367 | 1699 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 324851 | 41093 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 22337 | 4533 |
| WALLS | 324851 | 41093 |
| | 778925.08 | 117963.46 |

| | |
|---|---|
| CENTER OF MASS X = | 181.77 |
| CENTER OF MASS Y = | 27.53 |
| Total center of mass X = | 181.80 |
| Total center of mass Y = | 28.06 |

13093

**Title :** QUAD C **Job #**

**Dsgnr:** **Date:**

**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d

**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 356 -- 2ND FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 7,738.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.80 ft |
| X-X Axis Shear | 7,738.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.06 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.230 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 12.810 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 16.200 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 16.200 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 12.930 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 13.280 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 12.930 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 11.483 | 2,993.238 | 120.070 | 3,113.308 |
| 2 | 11.483 | 4,658.977 | -120.679 | 4,658.977 |
| 3 | -18.088 | 1,698.702 | 299.390 | 1,998.092 |
| 4 | 18.245 | 1,698.702 | 301.815 | 2,000.517 |
| 5 | -18.088 | 1,355.816 | 119.624 | 1,475.440 |
| 6 | 18.245 | 1,392.516 | 0.271 | 1,392.787 |
| 7 | 18.245 | 1,355.816 | 120.519 | 1,476.334 |

## Summary

| | | | | |
|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.721 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | |
| Y Distance to Center of Rigidity | 19.618 ft | Xcm + .05*Max-X - X-cr = | 18.245 ft | Torsion = 141182.71 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.088 ft | Torsion = -139962.05 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 11.483 ft | Torsion = 88,856.87 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 5.400 ft | Torsion = 41,786.62 k-ft |

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 356 -- 3RD FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 5,926.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.83 ft |
| X-X Axis Shear | 5,926.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.45 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.750 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 9.030 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 13.400 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 13.400 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 9.240 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 9.490 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 9.240 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 10.078 | 2,516.768 | 77.281 | 2,594.049 |
| 2 | 10.078 | 3,366.877 | -77.444 | 3,366.877 |
| 3 | -18.050 | 1,426.606 | 234.852 | 1,661.458 |
| 4 | 18.283 | 1,426.606 | 237.746 | 1,664.352 |
| 5 | -18.050 | 983.719 | 81.067 | 1,064.786 |
| 6 | 18.283 | 1,010.335 | 0.191 | 1,010.526 |
| 7 | 18.283 | 983.719 | 82.022 | 1,065.741 |

## Summary

| | | | | |
|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.714 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | |
| Y Distance to Center of Rigidity | 21.414 ft | Xcm + .05*Max-X - X-cr = | 18.283 ft | Torsion = 108343.00 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.050 ft | Torsion = -106966.35 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 10.078 ft | Torsion = 59,721.34 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 3.995 ft | Torsion = 23,673.48 k-ft |

B095

Title : QUAD C Job #
Dsgnr: Date:
Description : Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
Scope : Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 356 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 0.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 182.00 ft |
| X-X Axis Shear | 2,625.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.54 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.630 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 6.770 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Pin | 1.0 |
| 3 | 10.230 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 10.230 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 0.500 | 20.000 | 12.580 | 15.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 0.500 | 20.000 | 12.580 | 35.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 0.500 | 20.000 | 12.580 | 55.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 8 | 0.500 | 20.000 | 12.580 | 75.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 9 | 0.500 | 20.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 10 | 0.500 | 20.000 | 12.580 | 106.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 11 | 0.500 | 20.000 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 12 | 0.500 | 20.000 | 12.580 | 146.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 13 | 0.500 | 20.000 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 14 | 0.500 | 20.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 15 | 0.500 | 20.000 | 12.580 | 197.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 16 | 0.500 | 20.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 17 | 0.500 | 20.000 | 12.580 | 237.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 18 | 0.500 | 20.000 | 12.580 | 257.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 19 | 0.500 | 20.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 20 | 0.500 | 20.000 | 12.580 | 287.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 21 | 0.500 | 20.000 | 12.580 | 307.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 22 | 0.500 | 20.000 | 12.580 | 327.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 23 | 0.500 | 20.000 | 12.580 | 347.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.878 | 1,191.016 | 37.353 | 1,228.369 |
| 2 | 8.878 | 1,432.180 | -37.358 | 1,432.180 |
| 3 | 8.878 | 0.902 | 55.931 | 56.833 |
| 4 | 8.878 | 0.902 | 55.929 | 56.831 |
| 5 | 8.878 | 0.000 | 0.696 | 0.696 |
| 6 | 8.878 | 0.000 | 0.612 | 0.612 |
| 7 | 8.878 | 0.000 | 0.528 | 0.528 |
| 8 | 8.878 | 0.000 | 0.444 | 0.444 |
| 9 | 8.878 | 0.000 | 0.381 | 0.381 |
| 10 | 8.878 | 0.000 | 0.316 | 0.316 |
| 11 | 8.878 | 0.000 | 0.232 | 0.232 |
| 12 | 8.878 | 0.000 | 0.148 | 0.148 |
| 13 | 8.878 | 0.000 | 0.064 | 0.064 |

**Description** QUAD C, BUILDING 356 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

| | | | | |
|---|---|---|---|---|
| 14 | 8.878 | 0.000 | 0.001 | 0.001 |
| 15 | 8.878 | 0.000 | 0.064 | 0.064 |
| 16 | 8.878 | 0.000 | 0.148 | 0.148 |
| 17 | 8.878 | 0.000 | 0.232 | 0.232 |
| 18 | 8.878 | 0.000 | 0.316 | 0.316 |
| 19 | 8.878 | 0.000 | 0.381 | 0.381 |
| 20 | 8.878 | 0.000 | 0.444 | 0.444 |
| 21 | 8.878 | 0.000 | 0.528 | 0.528 |
| 22 | 8.878 | 0.000 | 0.612 | 0.612 |
| 23 | 8.878 | 0.000 | 0.695 | 0.696 |

## Summary

| | | | | | | |
|---|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.668 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | | |
| Y Distance to Center of Rigidity | 22.703 ft | Xcm + .05*Max-X - X-cr | = | 18.498 ft | Torsion = | 0.00 k-ft |
| | | Xcm - .05*Max-X - X-cr | = | -17.835 ft | Torsion = | 0.00 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr | = | 8.878 ft | Torsion = | 23,305.56 k-ft |
| | | Ycm - .05*Max-Y - Y-cr | = | 2.795 ft | Torsion = | 7,337.68 k-ft |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/03/03
TIME: 10:51 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: GROUND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 97119 | 97119 | 0.315 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.151 |
| PIER (17-29) | | | | | 0.000 | 0 | 100599 | 100599 | 0.326 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 210.01 TOTAL (PIERS ONLY) = 308232 1.000
THKred = 10.19 WALL RIGIDITY = 264861 (K/IN)

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 1 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| PIER 2 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 23.17 TOTAL (PIERS ONLY) = 64399 1.000
WALL RIGIDITY = 32046 (K/IN)

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 123.67 | 0.036 | 367541 | 0 | 367541 | NA |
| PIER 3 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 4 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 5 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 6 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 7 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 8 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.018 |
| PIER 9 | FIXED | 12.00 | 4.50 | 5.83 | 0.772 | 14293 | 0 | 14293 | 0.099 |
| PIER 10 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 11 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 12 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 13 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 14 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 15 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 63.00 TOTAL (PIERS ONLY) = 143679 1.000
WALL RIGIDITY = 97119 (K/IN)

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 125.67 | 0.036 | 373490 | 0 | 373490 | NA |
| PIER 17 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 18 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 19 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 20 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 21 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 22 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 23 | FIXED | 12.00 | 4.50 | 7.83 | 0.575 | 20825 | 0 | 20825 | 0.139 |
| PIER 24 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.017 |
| PIER 25 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 26 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 27 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 28 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 29 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 150210 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 100599 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 30 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| PIER 31 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 64399 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32046 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.23 | 12.58 | 363.33 | 0.035 | 264918 | 0 | 264918 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 264918 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:59 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3113 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3113.00 | 12.00 | 4353.96 | 12797.98 | 39161.5 | 0.72 |
| PIER (1-2) | 0.104 | 323.6 | 12.00 | 335.04 | 984.81 | 3236.4 | 0.77 |
| PIER (3-15) | 0.315 | 980.9 | 12.00 | 1481.04 | 4353.35 | 9808.6 | 0.53 |
| PIER 16 | 0.151 | 468.9 | 12.00 | 425.04 | 1249.36 | 4688.6 | 0.88 |
| PIER (17-29) | 0.326 | 1016.0 | 12.00 | 1505.04 | 4423.90 | 10160.0 | 0.54 |
| PIER (30-31) | 0.104 | 323.6 | 12.00 | 335.04 | 984.81 | 3236.4 | 0.77 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 3113.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.821 | 265.7 | 12.00 | 215.04 | 632.09 | 597.81 | 0.22 |
| PIER 2 | 0.179 | 58.0 | 12.00 | 57.00 | 167.55 | 130.39 | 0.18 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 323.6 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 4 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 5 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 6 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 7 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 8 | 0.018 | 17.4 | 12.00 | 23.04 | 67.72 | 39.08 | 0.14 |
| PIER 9 | 0.099 | 97.6 | 12.00 | 66.96 | 196.82 | 219.55 | 0.26 |
| PIER 10 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 11 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 12 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 13 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 14 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| PIER 15 | 0.080 | 78.7 | 12.00 | 57.00 | 167.55 | 177.12 | 0.25 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 980.9 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 18 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 19 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 20 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 21 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 22 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 23 | 0.139 | 140.9 | 12.00 | 90.96 | 267.37 | 316.92 | 0.28 |
| PIER 24 | 0.017 | 17.2 | 12.00 | 23.04 | 67.72 | 38.72 | 0.14 |
| PIER 25 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 26 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 27 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 28 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| PIER 29 | 0.077 | 78.0 | 12.00 | 57.00 | 167.55 | 175.49 | 0.25 |
| | 1.000 | 1016.0 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.179 | 58.0 | 12.00 | 57.00 | 167.55 | 130.39 | 0.18 |
| PIER 31 | 0.821 | 265.7 | 12.00 | 215.04 | 632.09 | 597.81 | 0.22 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 323.6 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/03/03
TIME: 10:53 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 68357 | 68357 | 0.278 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 71882 | 71882 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 210.01 TOTAL (PIERS ONLY) = 245735 1.000
THKred = 9.38 WALL RIGIDITY = 217359 (K/IN)

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| PIER 2 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 23.17 TOTAL (PIERS ONLY) = 42186 1.000
WALL RIGIDITY = 29536 (K/IN)

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 123.67 | 0.053 | 254321 | 0 | 254321 | NA |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 8 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 9 | FIXED | 12.00 | 6.50 | 5.83 | 1.115 | 8311 | 0 | 8311 | 0.104 |
| PIER 10 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 63.00 TOTAL (PIERS ONLY) = 79976 1.000
WALL RIGIDITY = 68357 (K/IN)

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 125.67 | 0.052 | 258441 | 0 | 258441 | NA |
| PIER 17 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 23 | FIXED | 12.00 | 6.50 | 7.83 | 0.830 | 12934 | 0 | 12934 | 0.153 |
| PIER 24 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 25 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 26 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 84599 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 71882 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| PIER 31 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 42186 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 29536 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.75 | 12.58 | 363.33 | 0.035 | 217278 | 0 | 217278 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217278 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:24 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2594 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2594.00 | 12.00 | 4353.96 | 12797.98 | 32632.5 | 0.60 |
| PIER (1-2) | 0.120 | 311.8 | 12.00 | 335.04 | 984.81 | 3117.9 | 0.75 |
| PIER (3-15) | 0.278 | 721.6 | 12.00 | 1481.04 | 4353.35 | 7215.8 | 0.39 |
| PIER 16 | 0.189 | 490.1 | 12.00 | 425.04 | 1249.36 | 4900.5 | 0.92 |
| PIER (17-29) | 0.293 | 758.8 | 12.00 | 1505.04 | 4423.90 | 7587.9 | 0.40 |
| PIER (30-31) | 0.120 | 311.8 | 12.00 | 335.04 | 984.81 | 3117.9 | 0.75 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 2594.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 264.4 | 12.00 | 215.04 | 632.09 | 859.14 | 0.26 |
| PIER 2 | 0.152 | 47.4 | 12.00 | 57.00 | 167.55 | 154.17 | 0.17 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 311.8 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 4 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 5 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 6 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 7 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 8 | 0.013 | 9.6 | 12.00 | 23.04 | 67.72 | 31.15 | 0.09 |
| PIER 9 | 0.104 | 75.0 | 12.00 | 66.96 | 196.82 | 243.71 | 0.23 |
| PIER 10 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 11 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 12 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 13 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 14 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| PIER 15 | 0.080 | 57.9 | 12.00 | 57.00 | 167.55 | 188.21 | 0.21 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 721.6 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 18 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 19 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 20 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 21 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 22 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 23 | 0.153 | 116.0 | 12.00 | 90.96 | 267.37 | 377.04 | 0.27 |
| PIER 24 | 0.013 | 9.5 | 12.00 | 23.04 | 67.72 | 30.97 | 0.09 |
| PIER 25 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 26 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 27 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 28 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| PIER 29 | 0.076 | 57.6 | 12.00 | 57.00 | 167.55 | 187.10 | 0.21 |
| | 1.000 | 758.8 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 47.4 | 12.00 | 57.00 | 167.55 | 154.17 | 0.17 |
| PIER 31 | 0.848 | 264.4 | 12.00 | 215.04 | 632.09 | 859.14 | 0.26 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 311.8 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/03/03
TIME: 11:18 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.00 | 12.58 | 363.33 | 0.035 | 321481 | 0 | 321481 | NA |
| SOLID STRIP | CANT | 10.00 | 10.00 | 363.33 | 0.028 | 404677 | 0 | 404677 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 56964 | 56964 | 0.278 |
| PIER 16 | FIXED | 10.00 | 10.00 | 35.67 | 0.280 | 38686 | 0 | 38686 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 59902 | 59902 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 210.01 TOTAL (PIERS ONLY) = 204779 1.000
THKred = 7.82 WALL RIGIDITY = 181067 (K/IN)

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 1 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| PIER 2 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 23.17 TOTAL (PIERS ONLY) = 35155 1.000
WALL RIGIDITY = 24614 (K/IN)

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 123.67 | 0.081 | 137572 | 0 | 137572 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 123.67 | 0.053 | 211934 | 0 | 211934 | NA |
| PIER 3 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 4 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 5 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 6 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 7 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 8 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 9 | FIXED | 10.00 | 6.50 | 5.83 | 1.115 | 6926 | 0 | 6926 | 0.104 |
| PIER 10 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 11 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 12 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 13 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 14 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 15 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |

Lremain = 63.00 TOTAL (PIERS ONLY) = 66647 1.000
WALL RIGIDITY = 56964 (K/IN)

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 125.67 | 0.080 | 139807 | 0 | 139807 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 125.67 | 0.052 | 215368 | 0 | 215368 | NA |
| PIER 17 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 18 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 19 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 20 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 21 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 22 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 23 | FIXED | 10.00 | 6.50 | 7.83 | 0.830 | 10779 | 0 | 10779 | 0.153 |
| PIER 24 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 25 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 26 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 27 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 28 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 29 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| | | | Lremain = | 65.00 | TOTAL (PIERS ONLY) = | | | 70499 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 59902 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 30 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| PIER 31 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | Lremain = | 23.17 | TOTAL (PIERS ONLY) = | | | 35155 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 24614 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 5.63 | 12.58 | 363.33 | 0.035 | 180994 | 0 | 180994 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 180994 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:42 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1228 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1228.00 | 10.00 | 4353.96 | 10664.98 | 15448.2 | 0.28 |
| PIER (1-2) | 0.120 | 147.6 | 10.00 | 335.04 | 820.68 | 1476.0 | 0.35 |
| PIER (3-15) | 0.278 | 341.6 | 10.00 | 1481.04 | 3627.79 | 3416.0 | 0.18 |
| PIER 16 | 0.189 | 232.0 | 10.00 | 425.04 | 1041.13 | 2319.9 | 0.44 |
| PIER (17-29) | 0.293 | 359.2 | 10.00 | 1505.04 | 3686.58 | 3592.1 | 0.19 |
| PIER (30-31) | 0.120 | 147.6 | 10.00 | 335.04 | 820.68 | 1476.0 | 0.35 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1228.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 125.1 | 10.00 | 215.04 | 526.74 | 406.72 | 0.12 |
| PIER 2 | 0.152 | 22.5 | 10.00 | 57.00 | 139.62 | 72.98 | 0.08 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 147.6 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 4 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 5 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 6 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 7 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 8 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.75 | 0.04 |
| PIER 9 | 0.104 | 35.5 | 10.00 | 66.96 | 164.02 | 115.37 | 0.11 |
| PIER 10 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 11 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 12 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 13 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 14 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| PIER 15 | 0.080 | 27.4 | 10.00 | 57.00 | 139.62 | 89.10 | 0.10 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 341.6 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 18 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 19 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 20 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 21 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 22 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 23 | 0.153 | 54.9 | 10.00 | 90.96 | 222.81 | 178.49 | 0.13 |
| PIER 24 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.66 | 0.04 |
| PIER 25 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 26 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 27 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 28 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| PIER 29 | 0.076 | 27.3 | 10.00 | 57.00 | 139.62 | 88.57 | 0.10 |
| | 1.000 | 359.2 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 22.5 | 10.00 | 57.00 | 139.62 | 72.98 | 0.08 |
| PIER 31 | 0.848 | 125.1 | 10.00 | 215.04 | 526.74 | 406.72 | 0.12 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 147.6 | | | | | |

B109

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 09:10 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 18.00 | 12.58 | 363.33 | 0.035 | 579408 | 0 | 579408 | NA |
| SOLID STRIP | FIXED | 18.00 | 4.50 | 363.33 | 0.012 | 1620373 | 0 | 1620373 | NA |
| PIER 1 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| PIER 2 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| PIER 3 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 4 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 5 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 6 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 7 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 8 | FIXED | 18.00 | 4.50 | 7.67 | 0.587 | 30463 | 0 | 30463 | 0.040 |
| PIER 9 | FIXED | 18.00 | 4.50 | 11.00 | 0.409 | 46293 | 0 | 46293 | 0.061 |
| PIER 10 | FIXED | 18.00 | 4.50 | 7.67 | 0.587 | 30463 | 0 | 30463 | 0.040 |
| PIER 11 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 12 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 13 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 14 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 15 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 16 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| PIER 17 | FIXED | 18.00 | 4.50 | 12.17 | 0.370 | 51752 | 0 | 51752 | 0.068 |
| PIER 18 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| PIER 19 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 20 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 21 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 22 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 23 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 24 | FIXED | 18.00 | 4.50 | 7.67 | 0.587 | 30463 | 0 | 30463 | 0.040 |
| PIER 25 | FIXED | 18.00 | 4.50 | 11.00 | 0.409 | 46293 | 0 | 46293 | 0.061 |
| PIER 26 | FIXED | 18.00 | 4.50 | 7.67 | 0.587 | 30463 | 0 | 30463 | 0.040 |
| PIER 27 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 28 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 29 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 30 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 31 | FIXED | 18.00 | 4.50 | 5.00 | 0.900 | 17297 | 0 | 17297 | 0.023 |
| PIER 32 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| PIER 33 | FIXED | 18.00 | 4.50 | 6.42 | 0.701 | 24359 | 0 | 24359 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 15.17

TOTAL (PIERS ONLY) = 758277 1.000
WALL RIGIDITY = 411940 (K/IN)

B110

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.81 | 12.58 | 363.33 | 0.035 | 412346 | 0 | 412346 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 412346 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:57 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4659 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 4659.00 | 18.00 | 4353.96 | 19196.96 | 58610.2 | 1.08 |
| PIER 1 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| PIER 2 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| PIER 3 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 4 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 5 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 6 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 7 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 8 | 0.040 | 187.2 | 18.00 | 89.04 | 392.58 | 421.1 | 0.38 |
| PIER 9 | 0.061 | 284.4 | 18.00 | 129.00 | 568.77 | 640.0 | 0.40 |
| PIER 10 | 0.040 | 187.2 | 18.00 | 89.04 | 392.58 | 421.1 | 0.38 |
| PIER 11 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 12 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 13 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 14 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 15 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 16 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| PIER 17 | 0.068 | 318.0 | 18.00 | 143.04 | 630.68 | 715.4 | 0.40 |
| PIER 18 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| PIER 19 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 20 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 21 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 22 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 23 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 24 | 0.040 | 187.2 | 18.00 | 89.04 | 392.58 | 421.1 | 0.38 |
| PIER 25 | 0.061 | 284.4 | 18.00 | 129.00 | 568.77 | 640.0 | 0.40 |
| PIER 26 | 0.040 | 187.2 | 18.00 | 89.04 | 392.58 | 421.1 | 0.38 |
| PIER 27 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 28 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 29 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 30 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 31 | 0.023 | 106.3 | 18.00 | 57.00 | 251.32 | 239.1 | 0.34 |
| PIER 32 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| PIER 33 | 0.032 | 149.7 | 18.00 | 74.04 | 326.45 | 336.8 | 0.37 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 4659.0 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 09:10 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 363.33 | 0.035 | 515030 | 0 | 515030 | NA |
| SOLID STRIP | FIXED | 16.00 | 6.50 | 363.33 | 0.018 | 997093 | 0 | 997093 | NA |
| PIER 1 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| PIER 2 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| PIER 3 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 4 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 5 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 6 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 7 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 8 | FIXED | 16.00 | 6.50 | 7.67 | 0.847 | 16754 | 0 | 16754 | 0.042 |
| PIER 9 | FIXED | 16.00 | 6.50 | 11.00 | 0.591 | 26843 | 0 | 26843 | 0.067 |
| PIER 10 | FIXED | 16.00 | 6.50 | 7.67 | 0.847 | 16754 | 0 | 16754 | 0.042 |
| PIER 11 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 12 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 13 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 14 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 15 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 16 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| PIER 17 | FIXED | 16.00 | 6.50 | 12.17 | 0.534 | 30314 | 0 | 30314 | 0.076 |
| PIER 18 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| PIER 19 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 20 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 21 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 22 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 23 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 24 | FIXED | 16.00 | 6.50 | 7.67 | 0.847 | 16754 | 0 | 16754 | 0.042 |
| PIER 25 | FIXED | 16.00 | 6.50 | 11.00 | 0.591 | 26843 | 0 | 26843 | 0.067 |
| PIER 26 | FIXED | 16.00 | 6.50 | 7.67 | 0.847 | 16754 | 0 | 16754 | 0.042 |
| PIER 27 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 28 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 29 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 30 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 31 | FIXED | 16.00 | 6.50 | 5.00 | 1.300 | 8558 | 0 | 8558 | 0.021 |
| PIER 32 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| PIER 33 | FIXED | 16.00 | 6.50 | 6.42 | 1.012 | 12898 | 0 | 12898 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37 TOTAL (PIERS ONLY) = 399565 1.000
THKred = 12.36 WALL RIGIDITY = 290576 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.03 | 12.58 | 363.33 | 0.035 | 290670 | 0 | 290670 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 290670 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/05/03
TIME: 07:26 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3367 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3367.00 | 16.00 | 4353.96 | 17063.97 | 42356.9 | 0.78 |
| PIER 1 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| PIER 2 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| PIER 3 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 4 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 5 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 6 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 7 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 8 | 0.042 | 141.2 | 16.00 | 89.04 | 348.96 | 458.8 | 0.41 |
| PIER 9 | 0.067 | 226.2 | 16.00 | 129.00 | 505.57 | 735.2 | 0.46 |
| PIER 10 | 0.042 | 141.2 | 16.00 | 89.04 | 348.96 | 458.8 | 0.41 |
| PIER 11 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 12 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 13 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 14 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 15 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 16 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| PIER 17 | 0.076 | 255.4 | 16.00 | 143.04 | 560.60 | 830.2 | 0.47 |
| PIER 18 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| PIER 19 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 20 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 21 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 22 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 23 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 24 | 0.042 | 141.2 | 16.00 | 89.04 | 348.96 | 458.8 | 0.41 |
| PIER 25 | 0.067 | 226.2 | 16.00 | 129.00 | 505.57 | 735.2 | 0.46 |
| PIER 26 | 0.042 | 141.2 | 16.00 | 89.04 | 348.96 | 458.8 | 0.41 |
| PIER 27 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 28 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 29 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 30 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 31 | 0.021 | 72.1 | 16.00 | 57.00 | 223.39 | 234.4 | 0.33 |
| PIER 32 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| PIER 33 | 0.032 | 108.7 | 16.00 | 74.04 | 290.18 | 353.2 | 0.38 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 3367.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 09:11 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 363.33 | 0.035 | 385777 | 0 | 385777 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 363.33 | 0.018 | 747563 | 0 | 747563 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 2 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 8 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 9 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 10 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 16 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 17 | FIXED | 12.00 | 6.50 | 12.17 | 0.534 | 22735 | 0 | 22735 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 23 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 24 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 25 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 26 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 31 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 32 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 33 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 9.27

TOTAL (PIERS ONLY) = 299674 1.000
WALL RIGIDITY = 217796 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 6.77 | 12.58 | 363.33 | 0.035 | 217771 | 0 | 217771 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217771 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/05/03
TIME: 07:30 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1432 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1432.00 | 12.00 | 4353.96 | 12797.98 | 18014.6 | 0.33 |
| PIER 1 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| PIER 2 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| PIER 3 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 4 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 5 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 6 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 7 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 8 | 0.042 | 60.0 | 12.00 | 89.04 | 261.72 | 195.1 | 0.18 |
| PIER 9 | 0.067 | 96.2 | 12.00 | 129.00 | 379.18 | 312.7 | 0.19 |
| PIER 10 | 0.042 | 60.0 | 12.00 | 89.04 | 261.72 | 195.1 | 0.18 |
| PIER 11 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 12 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 13 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 14 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 15 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 16 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| PIER 17 | 0.076 | 108.6 | 12.00 | 143.04 | 420.45 | 353.1 | 0.20 |
| PIER 18 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| PIER 19 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 20 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 21 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 22 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 23 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 24 | 0.042 | 60.0 | 12.00 | 89.04 | 261.72 | 195.1 | 0.18 |
| PIER 25 | 0.067 | 96.2 | 12.00 | 129.00 | 379.18 | 312.7 | 0.19 |
| PIER 26 | 0.042 | 60.0 | 12.00 | 89.04 | 261.72 | 195.1 | 0.18 |
| PIER 27 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 28 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 29 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 30 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 31 | 0.021 | 30.7 | 12.00 | 57.00 | 167.55 | 99.7 | 0.14 |
| PIER 32 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| PIER 33 | 0.032 | 46.2 | 12.00 | 74.04 | 217.63 | 150.2 | 0.16 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1432.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 09:54 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 18.00 | 12.58 | 50.00 | 0.252 | 78006 | 0 | 78006 | NA |
| SOLID STRIP | FIXED | 18.00 | 4.50 | 50.00 | 0.090 | 222358 | 0 | 222358 | NA |
| PIER 1 | FIXED | 18.00 | 4.50 | 6.33 | 0.711 | 23915 | 0 | 23915 | 0.142 |
| PIER 2 | FIXED | 18.00 | 4.50 | 27.33 | 0.165 | 120724 | 0 | 120724 | 0.716 |
| PIER 3 | FIXED | 18.00 | 4.50 | 6.33 | 0.711 | 23915 | 0 | 23915 | 0.142 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 168554 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 70151 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.20 | 12.58 | 50.00 | 0.252 | 70206 | 0 | 70206 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 70206 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:54 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2001 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2001.00 | 18.00 | 594.00 | 2618.99 | 25172.6 | 3.40 |
| PIER 1 | 0.142 | 283.9 | 18.00 | 72.96 | 321.69 | 638.8 | 0.70 |
| PIER 2 | 0.716 | 1433.2 | 18.00 | 324.96 | 1432.78 | 3224.6 | 0.80 |
| PIER 3 | 0.142 | 283.9 | 18.00 | 72.96 | 321.69 | 638.8 | 0.70 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 2001.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 09:53 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 50.00 | 0.252 | 69339 | 0 | 69339 | NA |
| SOLID STRIP | FIXED | 16.00 | 6.50 | 50.00 | 0.130 | 136408 | 0 | 136408 | NA |
| PIER 1 | FIXED | 16.00 | 6.50 | 6.33 | 1.027 | 12621 | 0 | 12621 | 0.128 |
| PIER 2 | FIXED | 16.00 | 6.50 | 27.33 | 0.238 | 73525 | 0 | 73525 | 0.744 |
| PIER 3 | FIXED | 16.00 | 6.50 | 6.33 | 1.027 | 12621 | 0 | 12621 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 98767 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 58086 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 13.40 | 12.58 | 50.00 | 0.252 | 58071 | 0 | 58071 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 58071 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/05/03
TIME: 07:31 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1664 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1664.00 | 16.00 | 594.00 | 2328.00 | 20933.1 | 2.83 |
| PIER 1 | 0.128 | 212.6 | 16.00 | 72.96 | 285.94 | 691.1 | 0.76 |
| PIER 2 | 0.744 | 1238.7 | 16.00 | 324.96 | 1273.58 | 4025.9 | 0.99 |
| PIER 3 | 0.128 | 212.6 | 16.00 | 72.96 | 285.94 | 691.1 | 0.76 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1664.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/29/03
TIME: 06:15 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 50.00 | 0.252 | 48770 | 0 | 48770 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 50.00 | 0.130 | 100497 | 0 | 100497 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| PIER 2 | FIXED | 12.00 | 6.50 | 27.33 | 0.238 | 55144 | 0 | 55144 | 0.744 |
| PIER 3 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 74075 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41573 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.23 | 12.58 | 50.00 | 0.252 | 41576 | 0 | 41576 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41576 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/05/03
TIME: 07:31 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.8 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 56.80 | 12.00 | 594.00 | 1746.00 | 714.5 | 0.10 |
| PIER 1 | 0.128 | 7.3 | 12.00 | 72.96 | 214.46 | 23.6 | 0.03 |
| PIER 2 | 0.744 | 42.3 | 12.00 | 324.96 | 955.18 | 137.4 | 0.03 |
| PIER 3 | 0.128 | 7.3 | 12.00 | 72.96 | 214.46 | 23.6 | 0.03 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 56.8 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:53 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 7.00 | 50.00 | 0.140 | 110726 | 0 | 110726 | NA |
| PIER 1 | FIXED | 14.00 | 7.00 | 22.33 | 0.313 | 48108 | 0 | 48108 | 0.500 |
| PIER 2 | FIXED | 14.00 | 7.00 | 22.33 | 0.313 | 48108 | 0 | 48108 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 96216 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 56041 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.93 | 12.58 | 50.00 | 0.252 | 56035 | 0 | 56035 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 56035 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:53 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1476 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1476.00 | 14.00 | 594.00 | 2037.00 | 18568.1 | 2.51 |
| PIER 1 | 0.500 | 738.0 | 14.00 | 264.96 | 908.62 | 5166.0 | 1.57 |
| PIER 2 | 0.500 | 738.0 | 14.00 | 264.96 | 908.62 | 5166.0 | 1.57 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1476.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:21 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 68725 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 40029 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.24 | 12.58 | 50.00 | 0.252 | 40043 | 0 | 40043 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 40043 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:21 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1066 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1066.00 | 10.00 | 594.00 | 1455.00 | 13410.3 | 1.81 |
| PIER 1 | 0.500 | 533.0 | 10.00 | 264.96 | 649.02 | 3731.0 | 1.13 |
| PIER 2 | 0.500 | 533.0 | 10.00 | 264.96 | 649.02 | 3731.0 | 1.13 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1066.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 06:39 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 54980 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 30478 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.40 | 12.58 | 50.00 | 0.252 | 32069 | 0 | 32069 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 32069 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 01:50 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 7.00 | 50.00 | 0.140 | 110726 | 0 | 110726 | NA |
| PIER 1 | FIXED | 14.00 | 7.00 | 23.33 | 0.300 | 50406 | 0 | 50406 | 0.500 |
| PIER 2 | FIXED | 14.00 | 7.00 | 23.33 | 0.300 | 50406 | 0 | 50406 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 100811 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 57569 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 13.28 | 12.58 | 50.00 | 0.252 | 57551 | 0 | 57551 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 57551 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 03:01 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1393 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1393.00 | 14.00 | 594.00 | 2037.00 | 17523.9 | 2.37 |
| PIER 1 | 0.500 | 696.5 | 14.00 | 276.96 | 949.77 | 4875.5 | 1.41 |
| PIER 2 | 0.500 | 696.5 | 14.00 | 276.96 | 949.77 | 4875.5 | 1.41 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1393.0 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:16 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 72008 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41121 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.49 | 12.58 | 50.00 | 0.252 | 41127 | 0 | 41127 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41127 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 02/04/03
TIME: 02:16 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1012 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1012.00 | 10.00 | 594.00 | 1455.00 | 12731.0 | 1.72 |
| PIER 1 | 0.500 | 506.0 | 10.00 | 276.96 | 678.41 | 3542.0 | 1.03 |
| PIER 2 | 0.500 | 506.0 | 10.00 | 276.96 | 678.41 | 3542.0 | 1.03 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1012.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 356

DATE: 01/30/03
TIME: 06:40 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

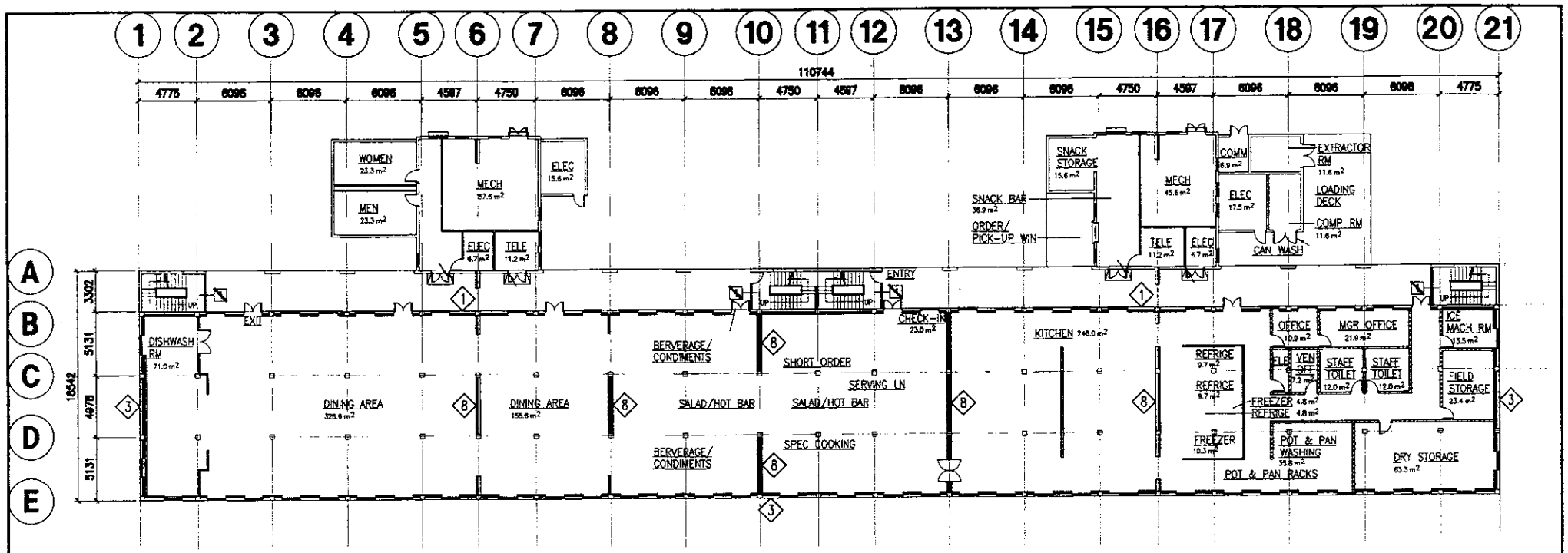
NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 57606 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 31268 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.58 | 12.58 | 50.00 | 0.252 | 32849 | 0 | 32849 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 32849 | (K/IN) |




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 357 - FIRST FLOOR PLAN

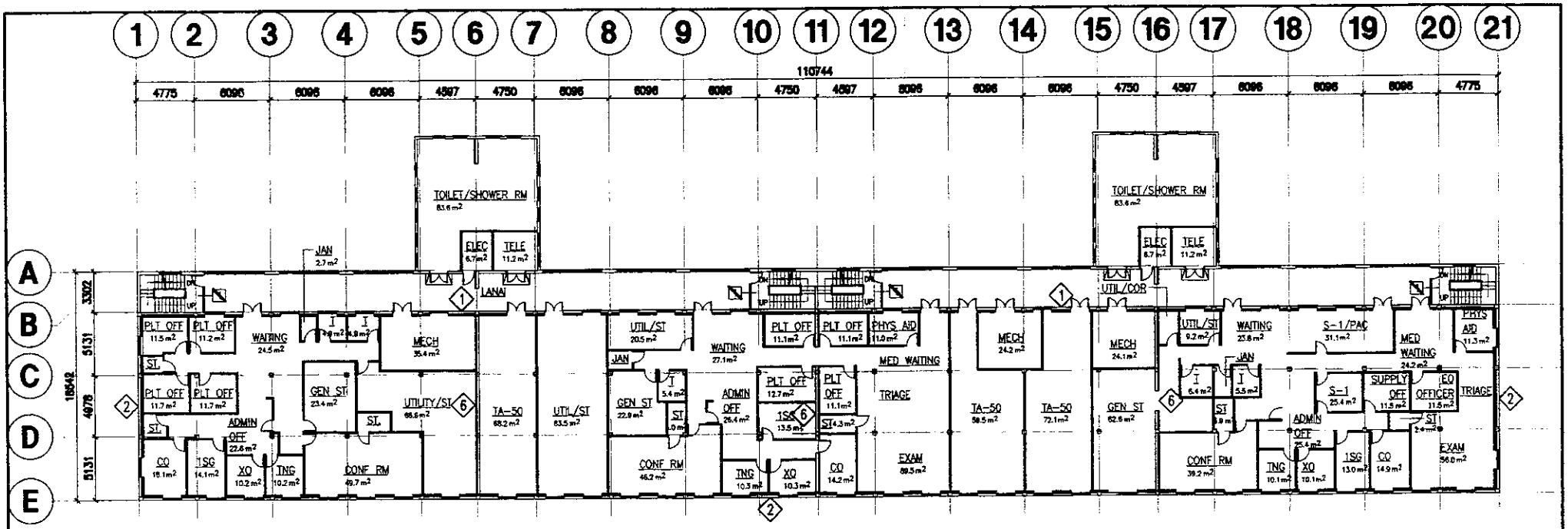
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 357, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 7

B140




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 357 - SECOND FLOOR PLAN

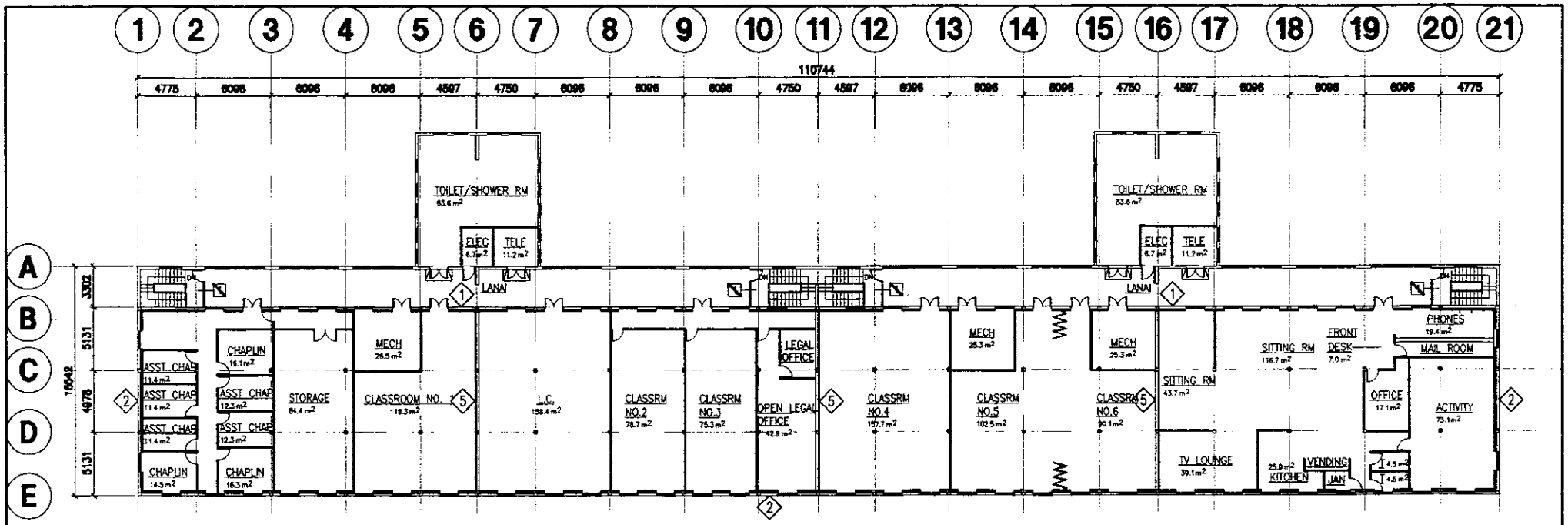
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 357, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 8

C141




## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

# BUILDING 357 - THIRD FLOOR PLAN

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 357, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 9

B142

PROJ: QUAD C, BUILDING 357 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:12 PM P.M.

V = C1*C2*C3*Sa*W
T=Ct*(hn)^3/4

Sxs=2/3*Fa*Ss
Sx1=2/3*Fv*S1
T0=(Sx1*Bs/Sxs*B1)

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER, Ss = 0.60
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC, S1 = 0.17

| | | | |
|---|---|---|---|
| PERFORMANCE LEVEL [IO,SE,LS,CP] = | IO | Bs = | 1.00 |
| SOIL CLASS [A, B, C, D, E, F] = | E | B1 = | 1.00 |
| % DAMPING = | 5.000 | T0 = | 0.62 |
| SITE COEFFICIENT, Fa = | 1.5 | C1 = | 1.28 |
| SITE COEFFICIENT, Fv = | 3.3 | C2 = | 1.00 |
| Ct FACTOR [0.035,0.030,0.020,0.060] = | 0.020 | C3 = | 1.00 |

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER, Sxs = 0.60
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC, Sx1 = 0.37

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T), Sa = 0.60

TOTAL BUILDING HEIGHT = 41.66 FT
BUILDING SEISMIC WEIGHT, W = 9918 KIPS

| | T (SEC) | k | BASE V (KIPS) |
|---|---|---|---|
| LINEAR STATIC METHOD | 0.33 | 1.00 | 7625.45 |

BASE SHEAR COEFFICIENT = 0.7688 x W
TOTAL DESIGN BASE SHEAR = 7625.4 KIPS

| Ct | LATERAL SYSTEM | %damping | Bs | B1 |
|---|---|---|---|---|
| 0.035 | Steel Moment Resisting Frames | 2.00 | 0.80 | 0.80 |
| 0.030 | RC Moment Resisting Frames | 5.00 | 1.00 | 1.00 |
| 0.030 | Eccentrically Braced Frames | 10.00 | 1.20 | 1.20 |
| 0.020 | All Oher Buildings | | | |
| 0.060 | Wood Buildings | | | |

PROJ: QUAD C, BUILDING 357 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:12 PM P.M.

| CLASS | SITE DESCRIPTION - SOIL PROFILES |
|---|---|
| A | HARD ROCK, SHEAR WAVE VELOCITY Vs > 5000 FT/S. |
| B | ROCK, SHEAR WAVE VELOCITY Vs FROM 2500 TO 5000 FT/S. |
| C | VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY Vs FROM 1200 TO 2500 FT/S. |
| D | STIFF SOIL, SHEAR WAVE VELOCITY Vs FROM 600 TO 1200 FT/S. |
| E | SOFT SOIL, SHEAR WAVE VELOCITY Vs < 600 FT/S. (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.) |
| F | SOIL REQUIRING SITE-SPECIFIC EVALUATION. |

SITE COEFFICIENT, Fa (Based on Site Class & Spectral Response Acceleration Ss)

| | SPECTRAL RESPONSE ACCELERATION, Ss | | | | |
|---|---|---|---|---|---|
| CLASS | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.20 | 1.20 | 1.10 | 1.00 | 1.00 |
| D | 1.60 | 1.40 | 1.20 | 1.10 | 1.00 |
| E | 2.50 | 1.70 | 1.20 | 0.90 | NA |
| F | NA | NA | NA | NA | NA |

SITE COEFFICIENT, Fv (Based on Site Class & Spectral Response Acceleration S1)

| | SPECTRAL RESPONSE ACCELERATION, S1 | | | | |
|---|---|---|---|---|---|
| CLASS | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 |
| D | 2.40 | 2.00 | 1.80 | 1.60 | 1.50 |
| E | 3.50 | 3.20 | 2.80 | 2.40 | NA |
| F | NA | NA | NA | NA | NA |

PROJ: QUAD C, BUILDING 357 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:12 PM P.M.

INCH-POUND UNITS:

| LEVEL | WEIGHT (kips) | DH (ft) | HEIGHT (ft) | W*H/1000 (ft-k) | FORCE (kips) | SHEAR (kips) | V*DH (ft-k) | MOMENT (ft-k) |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| ROOF | 1875 | | 41.7 | 78 | 2616.2 | | | 0 |
| | | 16.5 | | | | 2616.2 | 43167 | |
| 3RD | 3846 | | 25.2 | 97 | 3240.9 | | | 43167 |
| | | 12.6 | | | | 5857.1 | 73682 | |
| 2ND | 4197 | | 12.6 | 53 | 1768.3 | | | 116849 |
| | | 12.6 | | | | 7625.4 | 95928 | |
| GRND | | | | 0 | 0.0 | | | 212778 |
| | 9918 | 41.7 | | 228 | 7625.4 | | 212778 | |

B146



PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03
TITLE: ROOF TIME: 11:37 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | ROOF | 0.018 | 25054 | 438.45 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | | | 438.45 |

| BEAMS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| GRID B | 8.00 | 10.00 | 0.083 | 364.00 | 1.00 | 30.33 |
| GRID C | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID D | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID E | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| TRANS | 10.00 | 10.00 | 0.104 | 60.83 | 19.00 | 120.39 |
| TRANS-C to D | 12.50 | 12.50 | 0.163 | 60.83 | 19.00 | 188.11 |
| GRID 1, 21 | 6.50 | 70.00 | 0.474 | 50.00 | 2.00 | 47.40 |
| | | | | | | 807.11 |

| COLUMNS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 87.70 |

| WALLS: (ROOF) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 5.58 | 0.00 |
| | | | | | | 541.89 |

| | | |
|---|---|---|
| FLOORS | 438.45 | kips |
| BEAMS | 807.11 | kips |
| COLUMNS | 87.70 | kips |
| WALLS | 541.89 | kips |
| | 1875.15 | kips |

B147



PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:37 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (3RD FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | | | | | | 149.06 |

| WALLS: (3RD FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 10.82 | 150.00 | 0.135 | 364.00 | 6.04 | 297.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 21 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1319.62 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 149.06 | kips |
| WALLS | 1319.62 | kips |
| | 3846.38 | kips |

PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:37 AM

FLOORS: (2ND FL)

| DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|
| TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| BALCONY | 0.078 | 3942 | 307.49 |
| STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | 2188.87 |

BEAMS: (2ND FL)

| | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

COLUMNS: (2ND FL)

| | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 122.73 |

WALLS: (2ND FL)

| | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 10.82 | 150.00 | 0.135 | 364.00 | 6.04 | 297.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 21 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 10.19 | 150.00 | 0.127 | 364.00 | 6.04 | 280.04 |
| GRID E | 13.48 | 150.00 | 0.169 | 364.00 | 6.04 | 370.46 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 21 | 16.00 | 150.00 | 0.200 | 50.00 | 6.04 | 60.40 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 8 | 8.00 | 150.00 | 0.100 | 16.33 | 6.04 | 9.86 |
| GRID 10 | 8.00 | 150.00 | 0.100 | 33.67 | 6.04 | 20.34 |
| GRID 13 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1696.13 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 122.73 | kips |
| WALLS | 1696.13 | kips |
| | 4196.55 | kips |

CENTER OF MASS DETERMINATION



PROJECT: QUAD C, BUILDING 357 (w/ retrofit)
TITLE: ROOF

DATE: 02/03/03
TIME: 11:37 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | ROOF | 438.45 | 182.00 | 30.42 | 79797 | 13335 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 79797 | 13335 |

| BEAMS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 172.52 | 182.00 | 60.42 | 31399 | 10424 |
| | GRID B | 30.33 | 182.00 | 49.58 | 5521 | 1504 |
| | GRID C | 37.92 | 182.00 | 33.17 | 6901 | 1258 |
| | GRID D | 37.92 | 182.00 | 16.83 | 6901 | 638 |
| | GRID E | 172.52 | 182.00 | 0.42 | 31399 | 72 |
| | TRANS | 120.39 | 182.00 | 30.42 | 21911 | 3662 |
| | TRANS-C to D | 188.11 | 182.00 | 25.00 | 34237 | 4703 |
| | GRID 1, 21 | 47.40 | 182.00 | 30.42 | 8626 | 1442 |
| | | | | | 146894 | 23703 |

| COLUMNS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 15961 | 2983 |

| WALLS: (ROOF) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| | GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| | GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 98624 | 13502 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 79797 | 13335 |
| BEAMS | 146894 | 23703 |
| COLUMNS | 15961 | 2983 |
| WALLS | 98624 | 13502 |
| | 341277.03 | 53522.84 |

CENTER OF MASS X = 182.00
CENTER OF MASS Y = 28.54

B150



PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:37 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | | | | 27130 | 5250 |

| WALLS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| | GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| | GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| | GRID E | 297.36 | 182.00 | 0.33 | 54119 | 98 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 21 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 240172 | 32902 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 27130 | 5250 |
| WALLS | 240172 | 32902 |
| | 699038.57 | 110489.26 |

| | |
|---|---|
| CENTER OF MASS X = | 181.74 |
| CENTER OF MASS Y = | 28.73 |
| Total center of mass X = | 181.82 |
| Total center of mass Y = | 28.67 |

PROJECT: QUAD C, BUILDING 357 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:37 AM

| FLOORS: (2ND FL) DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | 397371 | 65441 |

| BEAMS: (2ND FL) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 34366 | 6896 |

| COLUMNS: (2ND FL) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 22337 | 4533 |

| WALLS: (2ND FL) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| GRID E | 297.36 | 182.00 | 0.33 | 54119 | 98 |
| GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| GRID 21 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| GRID B | 280.04 | 182.00 | 49.67 | 50968 | 13910 |
| GRID E | 370.46 | 182.00 | 0.33 | 67423 | 122 |
| GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| GRID 1 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| GRID 21 | 60.40 | 182.00 | 25.00 | 10993 | 1510 |
| GRID 6 | 30.20 | 90.75 | 25.00 | 2741 | 755 |
| GRID 8 | 9.86 | 146.33 | 25.00 | 1443 | 247 |
| GRID 10 | 20.34 | 146.33 | 25.00 | 2976 | 508 |
| GRID 13 | 30.20 | 217.00 | 25.00 | 6553 | 755 |
| GRID 16 | 30.20 | 272.58 | 25.00 | 8232 | 755 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 308655 | 41063 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 22337 | 4533 |
| WALLS | 308655 | 41063 |
| | 762729.04 | 117934.16 |

CENTER OF MASS X = 181.75
CENTER OF MASS Y = 28.10

Total center of mass X = 181.79
Total center of mass Y = 28.43

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 357 -- 2ND FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 7,625.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.79 ft |
| X-X Axis Shear | 7,625.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.10 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.230 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 11.370 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 14.400 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 14.400 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 8.670 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 14.000 | 16.330 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 14.000 | 16.830 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 8 | 14.000 | 16.830 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 9 | 12.640 | 50.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 10 | 11.200 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 10.106 | 3,169.411 | 110.960 | 3,280.370 |
| 2 | 10.106 | 4,378.639 | -111.328 | 4,378.639 |
| 3 | -22.633 | 1,467.465 | 375.925 | 1,843.391 |
| 4 | 13.700 | 1,467.465 | 216.331 | 1,683.797 |
| 5 | -22.633 | 883.536 | 116.059 | 999.596 |
| 6 | -22.633 | 389.563 | 32.108 | 421.671 |
| 7 | -22.633 | 405.851 | 11.123 | 416.973 |
| 8 | -22.633 | 405.851 | 11.123 | 416.973 |
| 9 | 13.700 | 1,288.108 | 32.969 | 1,321.077 |
| 10 | 13.700 | 1,141.362 | 82.026 | 1,223.388 |

## Summary

| | | | | |
|---|---|---|---|---|
| X Distance to Center of Rigidity | 186.257 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | |
| Y Distance to Center of Rigidity | 21.035 ft | Xcm + .05*Max-X - X-cr = | 13.700 ft | Torsion = 104462.16 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -22.633 ft | Torsion = -172576.97 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 10.106 ft | Torsion = 77,059.65 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 4.023 ft | Torsion = 30,676.77 k-ft |

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 357 -- 3RD FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 5,857.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.82 ft |
| X-X Axis Shear | 5,857.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.69 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.750 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Fix | 1.0 |
| 2 | 7.900 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 11.700 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 4 | 11.700 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 5 | 9.240 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 6 | 9.490 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Fix | 1.0 |
| 7 | 9.240 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Fix | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.682 | 2,682.377 | 69.309 | 2,751.686 |
| 2 | 8.682 | 3,139.374 | -69.375 | 3,139.374 |
| 3 | -18.062 | 1,316.416 | 226.579 | 1,542.995 |
| 4 | 18.271 | 1,316.416 | 229.062 | 1,545.479 |
| 5 | -18.062 | 1,039.631 | 89.576 | 1,129.207 |
| 6 | 18.271 | 1,067.760 | 0.209 | 1,067.969 |
| 7 | 18.271 | 1,039.631 | 90.507 | 1,130.138 |

## Summary

| | | | | |
|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.716 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | |
| Y Distance to Center of Rigidity | 23.049 ft | Xcm + .05*Max-X - X-cr = | 18.271 ft | Torsion = 107010.90 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.062 ft | Torsion = -105791.48 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.682 ft | Torsion = 50,851.33 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 2.599 ft | Torsion = 15,223.20 k-ft |

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 357 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 0.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 182.00 ft |
| X-X Axis Shear | 2,616.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.54 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.630 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 6.770 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Pin | 1.0 |
| 3 | 10.230 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 10.230 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 0.500 | 20.000 | 12.580 | 15.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 0.500 | 20.000 | 12.580 | 35.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 0.500 | 20.000 | 12.580 | 55.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 8 | 0.500 | 20.000 | 12.580 | 75.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 9 | 0.500 | 20.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 10 | 0.500 | 20.000 | 12.580 | 106.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 11 | 0.500 | 20.000 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 12 | 0.500 | 20.000 | 12.580 | 146.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 13 | 0.500 | 20.000 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 14 | 0.500 | 20.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 15 | 0.500 | 20.000 | 12.580 | 197.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 16 | 0.500 | 20.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 17 | 0.500 | 20.000 | 12.580 | 237.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 18 | 0.500 | 20.000 | 12.580 | 257.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 19 | 0.500 | 20.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 20 | 0.500 | 20.000 | 12.580 | 287.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 21 | 0.500 | 20.000 | 12.580 | 307.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 22 | 0.500 | 20.000 | 12.580 | 327.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 23 | 0.500 | 20.000 | 12.580 | 347.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.878 | 1,186.932 | 37.225 | 1,224.157 |
| 2 | 8.878 | 1,427.270 | -37.230 | 1,427.270 |
| 3 | 8.878 | 0.898 | 55.740 | 56.638 |
| 4 | 8.878 | 0.898 | 55.738 | 56.636 |
| 5 | 8.878 | 0.000 | 0.693 | 0.693 |
| 6 | 8.878 | 0.000 | 0.610 | 0.610 |
| 7 | 8.878 | 0.000 | 0.526 | 0.526 |
| 8 | 8.878 | 0.000 | 0.443 | 0.443 |
| 9 | 8.878 | 0.000 | 0.380 | 0.380 |
| 10 | 8.878 | 0.000 | 0.315 | 0.315 |
| 11 | 8.878 | 0.000 | 0.231 | 0.231 |
| 12 | 8.878 | 0.000 | 0.148 | 0.148 |
| 13 | 8.878 | 0.000 | 0.064 | 0.064 |

**Description** QUAD C, BUILDING 357 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

| | | | | |
|---|---|---|---|---|
| 14 | 8.878 | 0.000 | 0.001 | 0.001 |
| 15 | 8.878 | 0.000 | 0.064 | 0.064 |
| 16 | 8.878 | 0.000 | 0.147 | 0.148 |
| 17 | 8.878 | 0.000 | 0.231 | 0.231 |
| 18 | 8.878 | 0.000 | 0.315 | 0.315 |
| 19 | 8.878 | 0.000 | 0.380 | 0.380 |
| 20 | 8.878 | 0.000 | 0.443 | 0.443 |
| 21 | 8.878 | 0.000 | 0.526 | 0.526 |
| 22 | 8.878 | 0.000 | 0.610 | 0.610 |
| 23 | 8.878 | 0.000 | 0.693 | 0.693 |

### Summary

| | | | | | | |
|---|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.668 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | | |
| Y Distance to Center of Rigidity | 22.703 ft | Xcm + .05*Max-X - X-cr | = | 18.498 ft | Torsion = | 0.00 k-ft |
| | | Xcm - .05*Max-X - X-cr | = | -17.835 ft | Torsion = | 0.00 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr | = | 8.878 ft | Torsion = | 23,225.65 k-ft |
| | | Ycm - .05*Max-Y - Y-cr | = | 2.795 ft | Torsion = | 7,312.52 k-ft |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/03/03
TIME: 11:04 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 97119 | 97119 | 0.315 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.151 |
| PIER (17-29) | | | | | 0.000 | 0 | 100599 | 100599 | 0.326 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 308232 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 264861 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 1 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| PIER 2 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 64399 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32046 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 123.67 | 0.036 | 367541 | 0 | 367541 | NA |
| PIER 3 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 4 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 5 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 6 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 7 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 8 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.018 |
| PIER 9 | FIXED | 12.00 | 4.50 | 5.83 | 0.772 | 14293 | 0 | 14293 | 0.099 |
| PIER 10 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 11 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 12 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 13 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 14 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 15 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 143679 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 97119 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 125.67 | 0.036 | 373490 | 0 | 373490 | NA |
| PIER 17 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 18 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 19 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 20 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 21 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 22 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 23 | FIXED | 12.00 | 4.50 | 7.83 | 0.575 | 20825 | 0 | 20825 | 0.139 |
| PIER 24 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.017 |
| PIER 25 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 26 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 27 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 28 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 29 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| | | | | | TOTAL (PIERS ONLY) = | | | 150210 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 100599 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 30 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| PIER 31 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 64399 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32046 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.23 | 12.58 | 363.33 | 0.035 | 264918 | 0 | 264918 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 264918 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:32 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3280 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3280.00 | 12.00 | 4353.96 | 12797.98 | 41262.4 | 0.76 |
| PIER (1-2) | 0.104 | 341.0 | 12.00 | 335.04 | 984.81 | 3410.1 | 0.82 |
| PIER (3-15) | 0.315 | 1033.5 | 12.00 | 1481.04 | 4353.35 | 10334.8 | 0.56 |
| PIER 16 | 0.151 | 494.0 | 12.00 | 425.04 | 1249.36 | 4940.1 | 0.93 |
| PIER (17-29) | 0.326 | 1070.5 | 12.00 | 1505.04 | 4423.90 | 10705.0 | 0.57 |
| PIER (30-31) | 0.104 | 341.0 | 12.00 | 335.04 | 984.81 | 3410.1 | 0.82 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 3280.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.821 | 279.9 | 12.00 | 215.04 | 632.09 | 629.88 | 0.23 |
| PIER 2 | 0.179 | 61.1 | 12.00 | 57.00 | 167.55 | 137.38 | 0.19 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 341.0 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 4 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 5 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 6 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 7 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 8 | 0.018 | 18.3 | 12.00 | 23.04 | 67.72 | 41.18 | 0.14 |
| PIER 9 | 0.099 | 102.8 | 12.00 | 66.96 | 196.82 | 231.33 | 0.28 |
| PIER 10 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 11 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 12 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 13 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 14 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| PIER 15 | 0.080 | 82.9 | 12.00 | 57.00 | 167.55 | 186.62 | 0.26 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 1033.5 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 18 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 19 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 20 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 21 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 22 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 23 | 0.139 | 148.4 | 12.00 | 90.96 | 267.37 | 333.93 | 0.29 |
| PIER 24 | 0.017 | 18.1 | 12.00 | 23.04 | 67.72 | 40.80 | 0.14 |
| PIER 25 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 26 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 27 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 28 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| PIER 29 | 0.077 | 82.2 | 12.00 | 57.00 | 167.55 | 184.90 | 0.26 |
| | 1.000 | 1070.5 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.179 | 61.1 | 12.00 | 57.00 | 167.55 | 137.38 | 0.19 |
| PIER 31 | 0.821 | 279.9 | 12.00 | 215.04 | 632.09 | 629.88 | 0.23 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 341.0 | | | | | |

B160

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/03/03
TIME: 11:01 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 68357 | 68357 | 0.278 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 71882 | 71882 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 245735 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 217359 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| PIER 2 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 42186 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 29536 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 123.67 | 0.053 | 254321 | 0 | 254321 | NA |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 8 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 9 | FIXED | 12.00 | 6.50 | 5.83 | 1.115 | 8311 | 0 | 8311 | 0.104 |
| PIER 10 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 79976 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 68357 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 125.67 | 0.052 | 258441 | 0 | 258441 | NA |
| PIER 17 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 23 | FIXED | 12.00 | 6.50 | 7.83 | 0.830 | 12934 | 0 | 12934 | 0.153 |
| PIER 24 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 25 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 26 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| | | | | | TOTAL (PIERS ONLY) = | | | 84599 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 71882 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| PIER 31 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 42186 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 29536 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.75 | 12.58 | 363.33 | 0.035 | 217278 | 0 | 217278 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217278 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:02 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2752 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2752.00 | 12.00 | 4353.96 | 12797.98 | 34620.2 | 0.64 |
| PIER (1-2) | 0.120 | 330.8 | 12.00 | 335.04 | 984.81 | 3307.8 | 0.79 |
| PIER (3-15) | 0.278 | 765.5 | 12.00 | 1481.04 | 4353.35 | 7655.3 | 0.41 |
| PIER 16 | 0.189 | 519.9 | 12.00 | 425.04 | 1249.36 | 5199.0 | 0.98 |
| PIER (17-29) | 0.293 | 805.0 | 12.00 | 1505.04 | 4423.90 | 8050.1 | 0.43 |
| PIER (30-31) | 0.120 | 330.8 | 12.00 | 335.04 | 984.81 | 3307.8 | 0.79 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 2752.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 280.5 | 12.00 | 215.04 | 632.09 | 911.47 | 0.34 |
| PIER 2 | 0.152 | 50.3 | 12.00 | 57.00 | 167.55 | 163.56 | 0.23 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 330.8 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 4 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 5 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 6 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 7 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 8 | 0.013 | 10.2 | 12.00 | 23.04 | 67.72 | 33.05 | 0.12 |
| PIER 9 | 0.104 | 79.6 | 12.00 | 66.96 | 196.82 | 258.55 | 0.31 |
| PIER 10 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 11 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 12 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 13 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 14 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| PIER 15 | 0.080 | 61.4 | 12.00 | 57.00 | 167.55 | 199.67 | 0.28 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 765.5 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 18 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 19 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 20 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 21 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 22 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 23 | 0.153 | 123.1 | 12.00 | 90.96 | 267.37 | 400.00 | 0.35 |
| PIER 24 | 0.013 | 10.1 | 12.00 | 23.04 | 67.72 | 32.86 | 0.11 |
| PIER 25 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 26 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 27 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 28 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| PIER 29 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.49 | 0.28 |
| | 1.000 | 805.0 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 50.3 | 12.00 | 57.00 | 167.55 | 163.56 | 0.23 |
| PIER 31 | 0.848 | 280.5 | 12.00 | 215.04 | 632.09 | 911.47 | 0.34 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 330.8 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/03/03
TIME: 11:07 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.00 | 12.58 | 363.33 | 0.035 | 321481 | 0 | 321481 | NA |
| SOLID STRIP | CANT | 10.00 | 10.00 | 363.33 | 0.028 | 404677 | 0 | 404677 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 56964 | 56964 | 0.278 |
| PIER 16 | FIXED | 10.00 | 10.00 | 35.67 | 0.280 | 38686 | 0 | 38686 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 59902 | 59902 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 204779 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 181067 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 1 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| PIER 2 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 35155 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 24614 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 123.67 | 0.081 | 137572 | 0 | 137572 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 123.67 | 0.053 | 211934 | 0 | 211934 | NA |
| PIER 3 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 4 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 5 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 6 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 7 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 8 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 9 | FIXED | 10.00 | 6.50 | 5.83 | 1.115 | 6926 | 0 | 6926 | 0.104 |
| PIER 10 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 11 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 12 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 13 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 14 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 15 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 66647 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 56964 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 125.67 | 0.080 | 139807 | 0 | 139807 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 125.67 | 0.052 | 215368 | 0 | 215368 | NA |
| PIER 17 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 18 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 19 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 20 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 21 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 22 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 23 | FIXED | 10.00 | 6.50 | 7.83 | 0.830 | 10779 | 0 | 10779 | 0.153 |
| PIER 24 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 25 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 26 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 27 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 28 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 29 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| | | | | | TOTAL (PIERS ONLY) = | | | 70499 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 59902 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 30 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| PIER 31 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 35155 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 24614 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 5.63 | 12.58 | 363.33 | 0.035 | 180994 | 0 | 180994 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 180994 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:13 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1224 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1224.00 | 10.00 | 4353.96 | 10664.98 | 15397.9 | 0.28 |
| PIER (1-2) | 0.120 | 147.1 | 10.00 | 335.04 | 820.68 | 1471.2 | 0.35 |
| PIER (3-15) | 0.278 | 340.5 | 10.00 | 1481.04 | 3627.79 | 3404.8 | 0.18 |
| PIER 16 | 0.189 | 231.2 | 10.00 | 425.04 | 1041.13 | 2312.3 | 0.44 |
| PIER (17-29) | 0.293 | 358.0 | 10.00 | 1505.04 | 3686.58 | 3580.4 | 0.19 |
| PIER (30-31) | 0.120 | 147.1 | 10.00 | 335.04 | 820.68 | 1471.2 | 0.35 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1224.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 124.7 | 10.00 | 215.04 | 526.74 | 405.39 | 0.15 |
| PIER 2 | 0.152 | 22.4 | 10.00 | 57.00 | 139.62 | 72.75 | 0.10 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 147.1 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 4 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 5 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 6 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 7 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 8 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.70 | 0.05 |
| PIER 9 | 0.104 | 35.4 | 10.00 | 66.96 | 164.02 | 115.00 | 0.14 |
| PIER 10 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 11 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 12 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 13 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 14 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| PIER 15 | 0.080 | 27.3 | 10.00 | 57.00 | 139.62 | 88.81 | 0.12 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 340.5 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 18 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 19 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 20 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 21 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 22 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 23 | 0.153 | 54.7 | 10.00 | 90.96 | 222.81 | 177.91 | 0.16 |
| PIER 24 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.61 | 0.05 |
| PIER 25 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 26 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 27 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 28 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| PIER 29 | 0.076 | 27.2 | 10.00 | 57.00 | 139.62 | 88.28 | 0.12 |
| | 1.000 | 358.0 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 22.4 | 10.00 | 57.00 | 139.62 | 72.75 | 0.10 |
| PIER 31 | 0.848 | 124.7 | 10.00 | 215.04 | 526.74 | 405.39 | 0.15 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 147.1 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:26 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 363.33 | 0.035 | 515030 | 0 | 515030 | NA |
| SOLID STRIP | FIXED | 16.00 | 4.50 | 363.33 | 0.012 | 1440331 | 0 | 1440331 | NA |
| PIER 1 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| PIER 2 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| PIER 3 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 4 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 5 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 6 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 7 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 8 | FIXED | 16.00 | 4.50 | 7.67 | 0.587 | 27079 | 0 | 27079 | 0.040 |
| PIER 9 | FIXED | 16.00 | 4.50 | 11.00 | 0.409 | 41150 | 0 | 41150 | 0.061 |
| PIER 10 | FIXED | 16.00 | 4.50 | 7.67 | 0.587 | 27079 | 0 | 27079 | 0.040 |
| PIER 11 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 12 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 13 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 14 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 15 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 16 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| PIER 17 | FIXED | 16.00 | 4.50 | 12.17 | 0.370 | 46001 | 0 | 46001 | 0.068 |
| PIER 18 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| PIER 19 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 20 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 21 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 22 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 23 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 24 | FIXED | 16.00 | 4.50 | 7.67 | 0.587 | 27079 | 0 | 27079 | 0.040 |
| PIER 25 | FIXED | 16.00 | 4.50 | 11.00 | 0.409 | 41150 | 0 | 41150 | 0.061 |
| PIER 26 | FIXED | 16.00 | 4.50 | 7.67 | 0.587 | 27079 | 0 | 27079 | 0.040 |
| PIER 27 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 28 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 29 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 30 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 31 | FIXED | 16.00 | 4.50 | 5.00 | 0.900 | 15375 | 0 | 15375 | 0.023 |
| PIER 32 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| PIER 33 | FIXED | 16.00 | 4.50 | 6.42 | 0.701 | 21653 | 0 | 21653 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 13.48

TOTAL (PIERS ONLY) = 674024 1.000
WALL RIGIDITY = 366169 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

B/C9

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 11.37 | 12.58 | 363.33 | 0.035 | 365993 | 0 | 365993 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 365993 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:26 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4379 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 4379.00 | 16.00 | 4353.96 | 17063.97 | 55087.8 | 1.01 |
| PIER 1 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| PIER 2 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| PIER 3 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 4 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 5 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 6 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 7 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 8 | 0.040 | 175.9 | 16.00 | 89.04 | 348.96 | 395.8 | 0.36 |
| PIER 9 | 0.061 | 267.3 | 16.00 | 129.00 | 505.57 | 601.5 | 0.37 |
| PIER 10 | 0.040 | 175.9 | 16.00 | 89.04 | 348.96 | 395.8 | 0.36 |
| PIER 11 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 12 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 13 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 14 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 15 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 16 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| PIER 17 | 0.068 | 298.9 | 16.00 | 143.04 | 560.60 | 672.4 | 0.38 |
| PIER 18 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| PIER 19 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 20 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 21 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 22 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 23 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 24 | 0.040 | 175.9 | 16.00 | 89.04 | 348.96 | 395.8 | 0.36 |
| PIER 25 | 0.061 | 267.3 | 16.00 | 129.00 | 505.57 | 601.5 | 0.37 |
| PIER 26 | 0.040 | 175.9 | 16.00 | 89.04 | 348.96 | 395.8 | 0.36 |
| PIER 27 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 28 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 29 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 30 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 31 | 0.023 | 99.9 | 16.00 | 57.00 | 223.39 | 224.7 | 0.32 |
| PIER 32 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| PIER 33 | 0.032 | 140.7 | 16.00 | 74.04 | 290.18 | 316.5 | 0.34 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 4379.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/30/03
TIME: 09:22 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 363.33 | 0.035 | 450651 | 0 | 450651 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 363.33 | 0.018 | 872456 | 0 | 872456 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 2 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 3 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 4 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 5 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 6 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 7 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 8 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 9 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.067 |
| PIER 10 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 11 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 12 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 13 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 14 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 15 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 16 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 17 | FIXED | 14.00 | 6.50 | 12.17 | 0.534 | 26525 | 0 | 26525 | 0.076 |
| PIER 18 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 19 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 20 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 21 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 22 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 23 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 24 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 25 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.067 |
| PIER 26 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 27 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 28 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 29 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 30 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 31 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 32 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 33 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 10.82

TOTAL (PIERS ONLY) = 349619 1.000
WALL RIGIDITY = 254254 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.90 | 12.58 | 363.33 | 0.035 | 254296 | 0 | 254296 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 254296 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:24 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3139 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3139.00 | 14.00 | 4353.96 | 14930.97 | 39488.6 | 0.73 |
| PIER 1 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| PIER 2 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| PIER 3 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 4 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 5 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 6 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 7 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 8 | 0.042 | 131.6 | 14.00 | 89.04 | 305.34 | 427.8 | 0.39 |
| PIER 9 | 0.067 | 210.9 | 14.00 | 129.00 | 442.38 | 685.4 | 0.43 |
| PIER 10 | 0.042 | 131.6 | 14.00 | 89.04 | 305.34 | 427.8 | 0.39 |
| PIER 11 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 12 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 13 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 14 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 15 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 16 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| PIER 17 | 0.076 | 238.1 | 14.00 | 143.04 | 490.53 | 774.0 | 0.43 |
| PIER 18 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| PIER 19 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 20 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 21 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 22 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 23 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 24 | 0.042 | 131.6 | 14.00 | 89.04 | 305.34 | 427.8 | 0.39 |
| PIER 25 | 0.067 | 210.9 | 14.00 | 129.00 | 442.38 | 685.4 | 0.43 |
| PIER 26 | 0.042 | 131.6 | 14.00 | 89.04 | 305.34 | 427.8 | 0.39 |
| PIER 27 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 28 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 29 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 30 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 31 | 0.021 | 67.2 | 14.00 | 57.00 | 195.47 | 218.5 | 0.31 |
| PIER 32 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| PIER 33 | 0.032 | 101.3 | 14.00 | 74.04 | 253.90 | 329.3 | 0.36 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 3139.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/30/03
TIME: 09:23 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 363.33 | 0.035 | 385777 | 0 | 385777 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 363.33 | 0.018 | 747563 | 0 | 747563 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 2 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 8 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 9 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 10 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 16 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 17 | FIXED | 12.00 | 6.50 | 12.17 | 0.534 | 22735 | 0 | 22735 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 23 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 24 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 25 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 26 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 31 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 32 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 33 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 9.27

TOTAL (PIERS ONLY) = 299674 1.000
WALL RIGIDITY = 217796 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 6.77 | 12.58 | 363.33 | 0.035 | 217771 | 0 | 217771 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217771 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:16 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1427 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1427.00 | 12.00 | 4353.96 | 12797.98 | 17951.7 | 0.33 |
| PIER 1 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| PIER 2 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| PIER 3 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 4 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 5 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 6 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 7 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 8 | 0.042 | 59.8 | 12.00 | 89.04 | 261.72 | 194.5 | 0.18 |
| PIER 9 | 0.067 | 95.9 | 12.00 | 129.00 | 379.18 | 311.6 | 0.19 |
| PIER 10 | 0.042 | 59.8 | 12.00 | 89.04 | 261.72 | 194.5 | 0.18 |
| PIER 11 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 12 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 13 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 14 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 15 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 16 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| PIER 17 | 0.076 | 108.3 | 12.00 | 143.04 | 420.45 | 351.9 | 0.20 |
| PIER 18 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| PIER 19 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 20 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 21 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 22 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 23 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 24 | 0.042 | 59.8 | 12.00 | 89.04 | 261.72 | 194.5 | 0.18 |
| PIER 25 | 0.067 | 95.9 | 12.00 | 129.00 | 379.18 | 311.6 | 0.19 |
| PIER 26 | 0.042 | 59.8 | 12.00 | 89.04 | 261.72 | 194.5 | 0.18 |
| PIER 27 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 28 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 29 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 30 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 31 | 0.021 | 30.6 | 12.00 | 57.00 | 167.55 | 99.3 | 0.14 |
| PIER 32 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| PIER 33 | 0.032 | 46.1 | 12.00 | 74.04 | 217.63 | 149.7 | 0.16 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1427.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/30/03
TIME: 09:55 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 16.00 | 12.58 | 50.00 | 0.252 | 69339 | 0 | 69339 | NA |
| SOLID STRIP | FIXED | 16.00 | 4.50 | 50.00 | 0.090 | 197652 | 0 | 197652 | NA |
| PIER 1 | FIXED | 16.00 | 4.50 | 6.33 | 0.711 | 21258 | 0 | 21258 | 0.142 |
| PIER 2 | FIXED | 16.00 | 4.50 | 27.33 | 0.165 | 107310 | 0 | 107310 | 0.716 |
| PIER 3 | FIXED | 16.00 | 4.50 | 6.33 | 0.711 | 21258 | 0 | 21258 | 0.142 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 149826 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 62356 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.40 | 12.58 | 50.00 | 0.252 | 62405 | 0 | 62405 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 62405 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:22 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1843 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1843.00 | 16.00 | 594.00 | 2328.00 | 23184.9 | 3.13 |
| PIER 1 | 0.142 | 261.5 | 16.00 | 72.96 | 285.94 | 588.4 | 0.65 |
| PIER 2 | 0.716 | 1320.0 | 16.00 | 324.96 | 1273.58 | 2970.0 | 0.73 |
| PIER 3 | 0.142 | 261.5 | 16.00 | 72.96 | 285.94 | 588.4 | 0.65 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 1843.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/30/03
TIME: 09:56 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 50.00 | 0.130 | 119357 | 0 | 119357 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 6.33 | 1.027 | 11043 | 0 | 11043 | 0.128 |
| PIER 2 | FIXED | 14.00 | 6.50 | 27.33 | 0.238 | 64335 | 0 | 64335 | 0.744 |
| PIER 3 | FIXED | 14.00 | 6.50 | 6.33 | 1.027 | 11043 | 0 | 11043 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 86421 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 50825 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 11.70 | 12.58 | 50.00 | 0.252 | 50704 | 0 | 50704 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 50704 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:58 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1545 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1545.00 | 14.00 | 594.00 | 2037.00 | 19436.1 | 2.63 |
| PIER 1 | 0.128 | 197.4 | 14.00 | 72.96 | 250.20 | 641.6 | 0.71 |
| PIER 2 | 0.744 | 1150.2 | 14.00 | 324.96 | 1114.38 | 3738.0 | 0.92 |
| PIER 3 | 0.128 | 197.4 | 14.00 | 72.96 | 250.20 | 641.6 | 0.71 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1545.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/29/03
TIME: 06:22 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 50.00 | 0.252 | 48770 | 0 | 48770 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 50.00 | 0.130 | 100497 | 0 | 100497 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| PIER 2 | FIXED | 12.00 | 6.50 | 27.33 | 0.238 | 55144 | 0 | 55144 | 0.744 |
| PIER 3 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 74075 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41573 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.23 | 12.58 | 50.00 | 0.252 | 41576 | 0 | 41576 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41576 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:18 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.6 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 56.60 | 12.00 | 594.00 | 1746.00 | 712.0 | 0.10 |
| PIER 1 | 0.128 | 7.2 | 12.00 | 72.96 | 214.46 | 23.5 | 0.03 |
| PIER 2 | 0.744 | 42.1 | 12.00 | 324.96 | 955.18 | 136.9 | 0.03 |
| PIER 3 | 0.128 | 7.2 | 12.00 | 72.96 | 214.46 | 23.5 | 0.03 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 56.6 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:39 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 7.00 | 50.00 | 0.140 | 110726 | 0 | 110726 | NA |
| PIER 1 | FIXED | 14.00 | 7.00 | 4.00 | 1.750 | 4260 | 0 | 4260 | 0.046 |
| PIER 2 | FIXED | 14.00 | 7.00 | 40.00 | 0.175 | 88235 | 0 | 88235 | 0.954 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 92496 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 54758 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.64 | 12.58 | 50.00 | 0.252 | 54778 | 0 | 54778 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 54778 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:39 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1321 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1321.00 | 14.00 | 594.00 | 2037.00 | 16618.2 | 2.25 |
| PIER 1 | 0.046 | 60.8 | 14.00 | 45.00 | 154.32 | 425.9 | 0.77 |
| PIER 2 | 0.954 | 1260.2 | 14.00 | 477.00 | 1635.77 | 8821.1 | 1.48 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1321.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:39 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOORS

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 7.00 | 50.00 | 0.140 | 110726 | 0 | 110726 | NA |
| PIER 1 | FIXED | 14.00 | 7.00 | 4.50 | 1.556 | 5383 | 0 | 5383 | 0.073 |
| PIER 2 | FIXED | 14.00 | 7.00 | 29.00 | 0.241 | 63352 | 0 | 63352 | 0.855 |
| PIER 3 | FIXED | 14.00 | 7.00 | 4.50 | 1.556 | 5383 | 0 | 5383 | 0.073 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 74118 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 47749 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 11.20 | 12.58 | 50.00 | 0.252 | 48537 | 0 | 48537 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 48537 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:39 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1223 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOORS

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1223.00 | 14.00 | 594.00 | 2037.00 | 15385.3 | 2.08 |
| PIER 1 | 0.073 | 88.8 | 14.00 | 51.00 | 174.89 | 621.8 | 0.99 |
| PIER 2 | 0.855 | 1045.4 | 14.00 | 345.00 | 1183.10 | 7317.5 | 1.70 |
| PIER 3 | 0.073 | 88.8 | 14.00 | 51.00 | 174.89 | 621.8 | 0.99 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1223.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:08 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR WALL AT DINING AREA

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 7.00 | 50.00 | 0.140 | 110726 | 0 | 110726 | NA |
| PIER 1 | FIXED | 14.00 | 7.00 | 6.00 | 1.167 | 9003 | 0 | 9003 | 0.173 |
| PIER 2 | FIXED | 14.00 | 7.00 | 16.33 | 0.429 | 34173 | 0 | 34173 | 0.655 |
| PIER 3 | FIXED | 14.00 | 7.00 | 6.00 | 1.167 | 9003 | 0 | 9003 | 0.173 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 52180 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 37573 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.67 | 12.58 | 50.00 | 0.252 | 37573 | 0 | 37573 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 37573 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 06:08 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1000 KIPS

WALL PORTION: GROUND FLOOR WALL AT DINING AREA

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1000.00 | 14.00 | 594.00 | 2037.00 | 12580.0 | 1.70 |
| PIER 1 | 0.173 | 172.5 | 14.00 | 69.00 | 236.62 | 1207.8 | 1.43 |
| PIER 2 | 0.655 | 654.9 | 14.00 | 192.96 | 661.71 | 4584.4 | 1.92 |
| PIER 3 | 0.173 | 172.5 | 14.00 | 69.00 | 236.62 | 1207.8 | 1.43 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1000.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:56 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 68725 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 40029 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.24 | 12.58 | 50.00 | 0.252 | 40043 | 0 | 40043 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 40043 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:56 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1130 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1130.00 | 10.00 | 594.00 | 1455.00 | 14215.4 | 1.92 |
| PIER 1 | 0.500 | 565.0 | 10.00 | 264.96 | 649.02 | 3955.0 | 1.20 |
| PIER 2 | 0.500 | 565.0 | 10.00 | 264.96 | 649.02 | 3955.0 | 1.20 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1130.0 | | | | | |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 01/30/03
TIME: 06:51 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 54980 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 30478 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:51 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 72008 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41121 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.49 | 12.58 | 50.00 | 0.252 | 41127 | 0 | 41127 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41127 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

DATE: 02/04/03
TIME: 05:51 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1068 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1068.00 | 10.00 | 594.00 | 1455.00 | 13435.4 | 1.82 |
| PIER 1 | 0.500 | 534.0 | 10.00 | 276.96 | 678.41 | 3738.0 | 1.08 |
| PIER 2 | 0.500 | 534.0 | 10.00 | 276.96 | 678.41 | 3738.0 | 1.08 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1068.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

DATE: 01/30/03
TIME: 06:50 AM

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 357

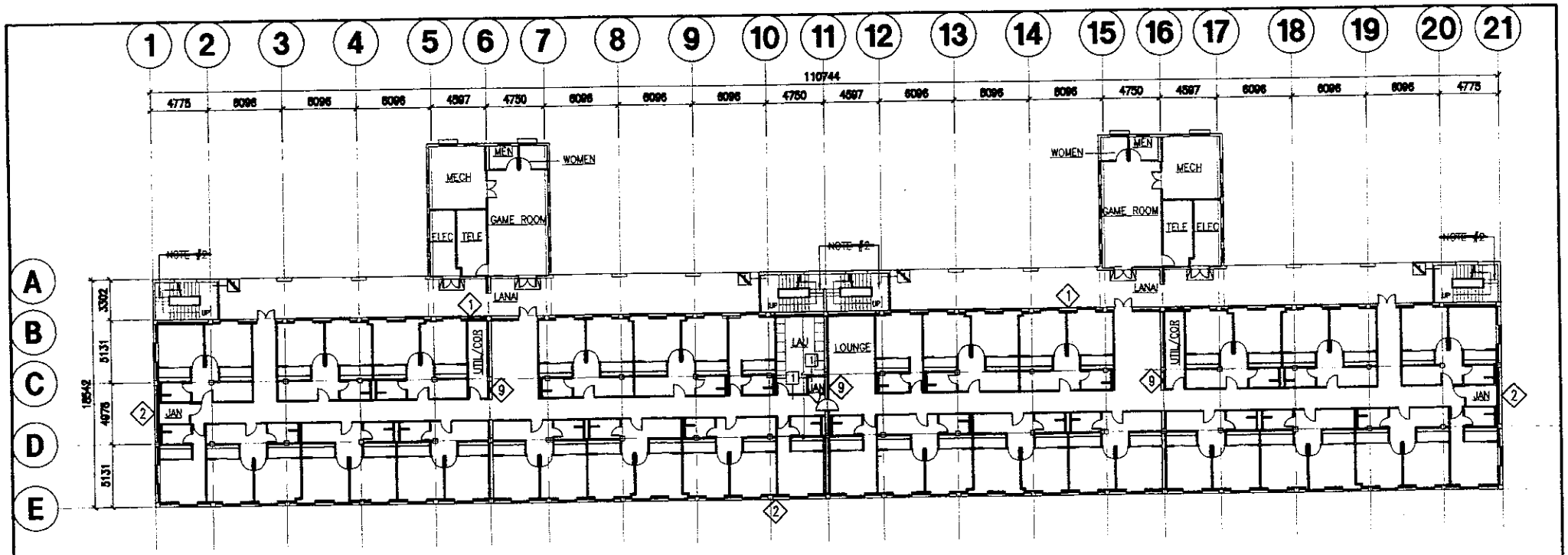
CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 57606 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 31268 | (K/IN) |




## BUILDING 358 - FIRST FLOOR PLAN

## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

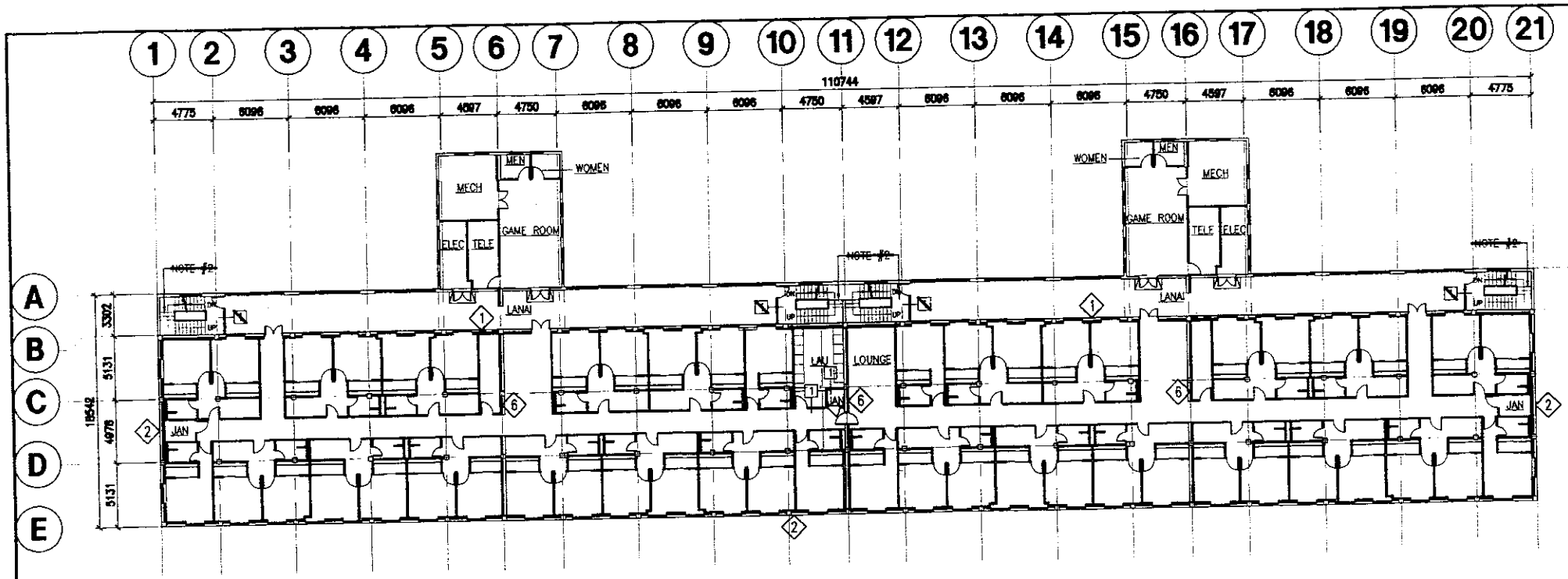
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, FIRST FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 10

B195




# BUILDING 358 - SECOND FLOOR PLAN

## SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

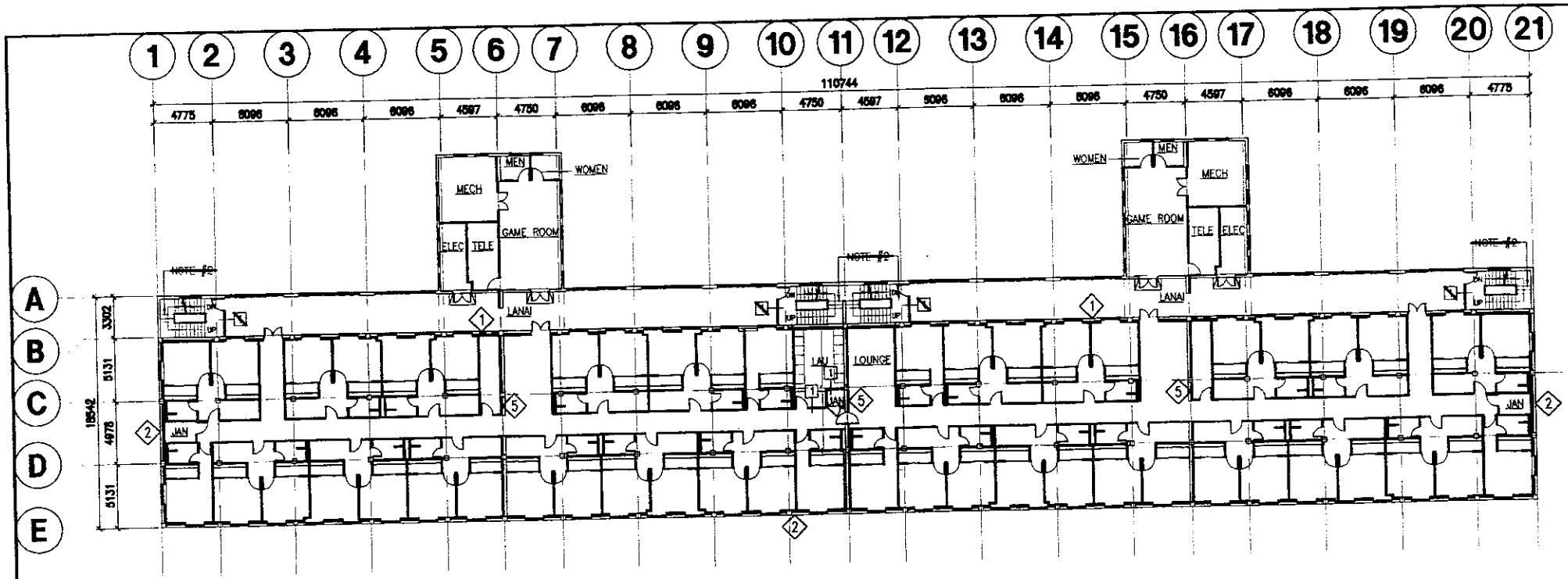
MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, SECOND FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 11

B19G




## BUILDING 358 - THIRD FLOOR PLAN

### SHEARWALL RETROFIT SCHEDULE

| DESIGNATION | DESCRIPTION |
|---|---|
| 1 | RETROFIT 4" SHOTCRETE WALL |
| 2 | RETROFIT 6" SHOTCRETE WALL |
| 3 | RETROFIT 8" SHOTCRETE WALL |
| 4 | RETROFIT 10" SHOTCRETE WALL |
| 5 | NEW 8" CONCRETE WALL |
| 6 | NEW 10" CONCRETE WALL |
| 7 | NEW 12" CONCRETE WALL |
| 8 | NEW 14" CONCRETE WALL |
| 9 | NEW 15" CONCRETE WALL |

MITSUNAGA & ASSOCIATES
747 AMANA STREET, STE. 216
HONOLULU, HAWAII 96814

SEISMIC EVALUATION and REHABILITATION REPORT
for QUAD "C" WHOLE BARRACKS RENEWAL
SCHOFIELD BARRACKS, OAHU, HAWAII
BUILDING 358, THIRD FLOOR PLAN

SCALE: NO SCALE | DATE: FEBRUARY 6, 2003

FIGURE 12

PROJ: QUAD C, BUILDING 358
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:13 PM P.M.

V = C1*C2*C3*Sa*W
T=Ct*(hn)^3/4

Sxs=2/3*Fa*Ss
Sx1=2/3*Fv*S1
T0=(Sx1*Bs/Sxs*B1)

SHORT PERIOD SPECTRAL RESPONSE ACCELERATION PARAMETER, Ss = 0.60
SPECTRAL RESPONSE ACCELERATION PARAMETER AT 1 SEC, S1 = 0.17

| | | | |
|---|---|---|---|
| PERFORMANCE LEVEL [IO,SE,LS,CP] = | IO | Bs = | 1.00 |
| SOIL CLASS [A, B, C, D, E, F] = | E | B1 = | 1.00 |
| % DAMPING = | 5.000 | T0 = | 0.62 |
| SITE COEFFICIENT, Fa = | 1.5 | C1 = | 1.28 |
| SITE COEFFICIENT, Fv = | 3.3 | C2 = | 1.00 |
| Ct FACTOR [0.035,0.030,0.020,0.060] = | 0.020 | C3 = | 1.00 |

DESIGN SHORT PERIOD RESPONSE ACCELERATION PARAMETER, Sxs = 0.60
DESIGN RESPONSE ACCELERATION PARAMETER AT 1 SEC, Sx1 = 0.37

RESPONSE SPECTRAL ACCELERATION (AT PERIOD T), Sa = 0.60

TOTAL BUILDING HEIGHT = 41.66 FT
BUILDING SEISMIC WEIGHT, W = 9826 KIPS

| | T (SEC) | k | BASE V (KIPS) |
|---|---|---|---|
| LINEAR STATIC METHOD | 0.33 | 1.00 | 7554.72 |

BASE SHEAR COEFFICIENT = 0.7688 x W
TOTAL DESIGN BASE SHEAR = 7554.7 KIPS

| Ct | LATERAL SYSTEM | %damping | Bs | B1 |
|---|---|---|---|---|
| 0.035 | Steel Moment Resisting Frames | 2.00 | 0.80 | 0.80 |
| 0.030 | RC Moment Resisting Frames | 5.00 | 1.00 | 1.00 |
| 0.030 | Eccentrically Braced Frames | 10.00 | 1.20 | 1.20 |
| 0.020 | All Oher Buildings | | | |
| 0.060 | Wood Buildings | | | |

PROJ: QUAD C, BUILDING 358 DATE: 03-Feb 2003
TITLE: w/ SHEAR WALL RETROFIT TIME: 01:13 PM P.M.

| CLASS | SITE DESCRIPTION - SOIL PROFILES |
|---|---|
| A | HARD ROCK, SHEAR WAVE VELOCITY Vs > 5000 FT/S. |
| B | ROCK, SHEAR WAVE VELOCITY Vs FROM 2500 TO 5000 FT/S. |
| C | VERY DENSE SOIL AND SOFT ROCK, SHEAR WAVE VELOCITY Vs FROM 1200 TO 2500 FT/S. |
| D | STIFF SOIL, SHEAR WAVE VELOCITY Vs FROM 600 TO 1200 FT/S. |
| E | SOFT SOIL, SHEAR WAVE VELOCITY Vs < 600 FT/S. (ASSUME CLASS E IF NO INFORMATION IS AVAILABLE.) |
| F | SOIL REQUIRING SITE-SPECIFIC EVALUATION. |

SITE COEFFICIENT, Fa (Based on Site Class & Spectral Response Acceleration Ss)

| | SPECTRAL RESPONSE ACCELERATION, Ss | | | | |
|---|---|---|---|---|---|
| CLASS | 0.25 | 0.50 | 0.75 | 1.00 | 1.25 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.20 | 1.20 | 1.10 | 1.00 | 1.00 |
| D | 1.60 | 1.40 | 1.20 | 1.10 | 1.00 |
| E | 2.50 | 1.70 | 1.20 | 0.90 | NA |
| F | NA | NA | NA | NA | NA |

SITE COEFFICIENT, Fv (Based on Site Class & Spectral Response Acceleration S1)

| | SPECTRAL RESPONSE ACCELERATION, S1 | | | | |
|---|---|---|---|---|---|
| CLASS | 0.10 | 0.20 | 0.30 | 0.40 | 0.50 |
| A | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 |
| B | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| C | 1.70 | 1.60 | 1.50 | 1.40 | 1.30 |
| D | 2.40 | 2.00 | 1.80 | 1.60 | 1.50 |
| E | 3.50 | 3.20 | 2.80 | 2.40 | NA |
| F | NA | NA | NA | NA | NA |

PROJ: QUAD C, BUILDING 358
TITLE: w/ SHEAR WALL RETROFIT

DATE: 03-Feb 2003
TIME: 01:13 PM P.M.

INCH-POUND UNITS:

| LEVEL | WEIGHT (kips) | DH (ft) | HEIGHT (ft) | W*H/1000 (ft-k) | FORCE (kips) | SHEAR (kips) | V*DH (ft-k) | MOMENT (ft-k) |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| | 0 | | 0.0 | 0 | 0.0 | | | 0 |
| | | 0.0 | | | | 0.0 | 0 | |
| ROOF | 1875 | | 41.7 | 78 | 2605.2 | | | 0 |
| | | 16.5 | | | | 2605.2 | 42985 | |
| 3RD | 3846 | | 25.2 | 97 | 3227.3 | | | 42985 |
| | | 12.6 | | | | 5832.4 | 73372 | |
| 2ND | 4105 | | 12.6 | 52 | 1722.3 | | | 116357 |
| | | 12.6 | | | | 7554.7 | 95038 | |
| GRND | | | | 0 | 0.0 | | | 211395 |
| | 9826 | 41.7 | | 227 | 7554.7 | | 211395 | |

B 201



PROJECT: QUAD C, BUILDING 358 (w/ retrofit)
TITLE: ROOF

DATE: 02/03/03
TIME: 11:38 AM

| FLOORS: (ROOF) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | ROOF | 0.018 | 25054 | 438.45 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | 0.000 | 0 | 0.00 |
| | | | | 438.45 |

| BEAMS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| GRID B | 8.00 | 10.00 | 0.083 | 364.00 | 1.00 | 30.33 |
| GRID C | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID D | 10.00 | 10.00 | 0.104 | 364.00 | 1.00 | 37.92 |
| GRID E | 6.50 | 70.00 | 0.474 | 364.00 | 1.00 | 172.52 |
| TRANS | 10.00 | 10.00 | 0.104 | 60.83 | 19.00 | 120.39 |
| TRANS-C to D | 12.50 | 12.50 | 0.163 | 60.83 | 19.00 | 188.11 |
| GRID 1, 21 | 6.50 | 70.00 | 0.474 | 50.00 | 2.00 | 47.40 |
| | | | | | | 807.11 |

| COLUMNS: (ROOF) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 87.70 |

| WALLS: (ROOF) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| GRID | 0.00 | 150.00 | 0.000 | 50.00 | 5.58 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 5.58 | 0.00 |
| | | | | | | 541.89 |

| | | |
|---|---|---|
| FLOORS | 438.45 | kips |
| BEAMS | 807.11 | kips |
| COLUMNS | 87.70 | kips |
| WALLS | 541.89 | kips |
| | 1875.15 | kips |

B202



PROJECT: QUAD C, BUILDING 358 (w/ retrofit)
TITLE: 3RD FL

DATE: 02/03/03
TIME: 11:38 AM

FLOORS: (3RD FL)

| DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|
| TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| BALCONY | 0.078 | 3942 | 307.49 |
| STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | 2188.87 |

BEAMS: (3RD FL)

| | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

COLUMNS: (3RD FL)

| | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.58 | 8.00 | 22.32 |
| GRID C | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID D | 16.00 | 16.00 | 0.267 | 5.58 | 19.00 | 28.27 |
| GRID E | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID B | 4.00 | 10.00 | 0.042 | 5.58 | 19.00 | 4.42 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | | | | | | 149.06 |

WALLS: (3RD FL)

| | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 7.82 | 150.00 | 0.098 | 364.00 | 5.58 | 198.54 |
| GRID E | 9.27 | 150.00 | 0.116 | 364.00 | 5.58 | 235.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 5.58 | 24.29 |
| GRID 1 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| GRID 21 | 12.00 | 150.00 | 0.150 | 50.00 | 5.58 | 41.85 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 10.82 | 150.00 | 0.135 | 364.00 | 6.04 | 297.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 21 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | 8.00 | 150.00 | 0.100 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1319.62 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 149.06 | kips |
| WALLS | 1319.62 | kips |
| | 3846.38 | kips |

PROJECT: QUAD C, BUILDING 358 (w/ retrofit)
TITLE: 2ND FL

DATE: 02/03/03
TIME: 11:38 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (ksf) | AREA (ft2) | TOTAL (kips) |
|---|---|---|---|---|
| | TYPICAL FLOOR | 0.101 | 18200 | 1838.20 |
| | BALCONY | 0.078 | 3942 | 307.49 |
| | STAIRS (add to balcony) | 0.092 | 253 | 23.26 |
| | STAIRS (add to balcony) | 0.092 | 217 | 19.93 |
| | | | | 2188.87 |

| BEAMS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | LENGTH (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 6.00 | 27.00 | 0.169 | 364.00 | 1.00 | 61.43 |
| GRID C | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| GRID D | 12.00 | 14.00 | 0.175 | 364.00 | 1.00 | 63.70 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 188.83 |

| COLUMNS: (2ND FL) | WIDTH (ins) | DEPTH (ins) | WEIGHT (klf) | HEIGHT (ft) | AMOUNT (ea) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID A | 10.00 | 48.00 | 0.500 | 5.17 | 8.00 | 20.68 |
| GRID C | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID D | 12.00 | 12.00 | 0.150 | 5.46 | 19.00 | 15.56 |
| GRID E | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| GRID B | 4.00 | 10.00 | 0.042 | 6.04 | 19.00 | 4.78 |
| | 0.00 | 0.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 122.73 |

| WALLS: (2ND FL) | THICK (ins) | WEIGHT (pcf) | WEIGHT (ksf) | LENGTH (ft) | HEIGHT (ft) | TOTAL (kips) |
|---|---|---|---|---|---|---|
| GRID B | 9.38 | 150.00 | 0.117 | 364.00 | 6.04 | 257.78 |
| GRID E | 10.82 | 150.00 | 0.135 | 364.00 | 6.04 | 297.36 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 21 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| GRID B | 10.19 | 150.00 | 0.127 | 364.00 | 6.04 | 280.04 |
| GRID E | 11.80 | 150.00 | 0.148 | 364.00 | 6.04 | 324.29 |
| GRID A | 10.00 | 150.00 | 0.125 | 34.83 | 6.04 | 26.30 |
| GRID 1 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 21 | 14.00 | 150.00 | 0.175 | 50.00 | 6.04 | 52.85 |
| GRID 6 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 11 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| GRID 16 | 8.00 | 150.00 | 0.100 | 50.00 | 6.04 | 30.20 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | 0.00 | 150.00 | 0.000 | 0.00 | 0.00 | 0.00 |
| | | | | | | 1604.66 |

| | | |
|---|---|---|
| FLOORS | 2188.87 | kips |
| BEAMS | 188.83 | kips |
| COLUMNS | 122.73 | kips |
| WALLS | 1604.66 | kips |
| | 4105.08 | kips |

# CENTER OF MASS DETERMINATION



PROJECT: QUAD C, BUILDING 358 (w/ retrofit)
TITLE: ROOF

DATE: 02/03/03
TIME: 11:38 AM

| FLOORS: (ROOF) DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| ROOF | 438.45 | 182.00 | 30.42 | 79797 | 13335 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 79797 | 13335 |

| BEAMS: (ROOF) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID A | 172.52 | 182.00 | 60.42 | 31399 | 10424 |
| GRID B | 30.33 | 182.00 | 49.58 | 5521 | 1504 |
| GRID C | 37.92 | 182.00 | 33.17 | 6901 | 1258 |
| GRID D | 37.92 | 182.00 | 16.83 | 6901 | 638 |
| GRID E | 172.52 | 182.00 | 0.42 | 31399 | 72 |
| TRANS | 120.39 | 182.00 | 30.42 | 21911 | 3662 |
| TRANS-C to D | 188.11 | 182.00 | 25.00 | 34237 | 4703 |
| GRID 1, 21 | 47.40 | 182.00 | 30.42 | 8626 | 1442 |
| | | | | 146894 | 23703 |

| COLUMNS: (ROOF) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 15961 | 2983 |

| WALLS: (ROOF) | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|
| GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| GRID | 0.00 | 182.00 | 25.00 | 0 | 0 |
| | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | 98624 | 13502 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 79797 | 13335 |
| BEAMS | 146894 | 23703 |
| COLUMNS | 15961 | 2983 |
| WALLS | 98624 | 13502 |
| | 341277.03 | 53522.84 |

CENTER OF MASS X = 182.00
CENTER OF MASS Y = 28.54

B205



PROJECT: QUAD C, BUILDING 358 (w/ retrofit) DATE: 02/03/03
TITLE: 3RD FL TIME: 11:38 AM

| FLOORS: (3RD FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 22.32 | 182.00 | 60.42 | 4062 | 1349 |
| | GRID C | 28.27 | 182.00 | 33.17 | 5146 | 938 |
| | GRID D | 28.27 | 182.00 | 16.83 | 5146 | 476 |
| | GRID E | 4.42 | 182.00 | 0.67 | 804 | 3 |
| | GRID B | 4.42 | 182.00 | 49.33 | 804 | 218 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | | | | 27130 | 5250 |

| WALLS: (3RD FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 198.54 | 182.00 | 49.67 | 36135 | 9862 |
| | GRID E | 235.36 | 182.00 | 0.33 | 42835 | 78 |
| | GRID A | 24.29 | 182.00 | 60.50 | 4421 | 1470 |
| | GRID 1 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | GRID 21 | 41.85 | 182.00 | 25.00 | 7617 | 1046 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| | GRID E | 297.36 | 182.00 | 0.33 | 54119 | 98 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 21 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 240172 | 32902 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 27130 | 5250 |
| WALLS | 240172 | 32902 |
| | 699038.57 | 110489.26 |

CENTER OF MASS X = 181.74
CENTER OF MASS Y = 28.73

Total center of mass X = 181.82
Total center of mass Y = 28.67

B206



PROJECT: QUAD C, BUILDING 358 (w/ retrofit) DATE: 02/03/03
TITLE: 2ND FL TIME: 11:38 AM

| FLOORS: (2ND FL) | DESCRIPTION | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | TYPICAL FLOOR | 1838.20 | 182.00 | 25.00 | 334552 | 45955 |
| | BALCONY | 307.49 | 182.00 | 55.42 | 55962 | 17039 |
| | STAIRS (add to balcony) | 23.26 | 182.00 | 55.42 | 4232 | 1289 |
| | STAIRS (add to balcony) | 19.93 | 131.67 | 58.12 | 2624 | 1158 |
| | | | | | 397371 | 65441 |

| BEAMS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 61.43 | 182.00 | 60.42 | 11179 | 3711 |
| | GRID C | 63.70 | 182.00 | 33.17 | 11593 | 2113 |
| | GRID D | 63.70 | 182.00 | 16.83 | 11593 | 1072 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 34366 | 6896 |

| COLUMNS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | GRID A | 20.68 | 182.00 | 60.42 | 3764 | 1249 |
| | GRID C | 15.56 | 182.00 | 33.17 | 2832 | 516 |
| | GRID D | 15.56 | 182.00 | 16.83 | 2832 | 262 |
| | GRID E | 4.78 | 182.00 | 0.67 | 870 | 3 |
| | GRID B | 4.78 | 182.00 | 49.33 | 870 | 236 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 22337 | 4533 |

| WALLS: (2ND FL) | | WEIGHT (kips) | X (ft) | Y (ft) | WEIGHTX (k-ft) | WEIGHTY (k-ft) |
|---|---|---|---|---|---|---|
| | GRID B | 257.78 | 182.00 | 49.67 | 46916 | 12804 |
| | GRID E | 297.36 | 182.00 | 0.33 | 54119 | 98 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 21 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | GRID B | 280.04 | 182.00 | 49.67 | 50968 | 13910 |
| | GRID E | 324.29 | 182.00 | 0.33 | 59020 | 107 |
| | GRID A | 26.30 | 182.00 | 60.50 | 4786 | 1591 |
| | GRID 1 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 21 | 52.85 | 182.00 | 25.00 | 9619 | 1321 |
| | GRID 6 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 11 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | GRID 16 | 30.20 | 182.00 | 25.00 | 5496 | 755 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | 0.00 | 0.00 | 0.00 | 0 | 0 |
| | | | | | 292048 | 39916 |

| | WEIGHTX | WEIGHTY |
|---|---|---|
| FLOORS | 397371 | 65441 |
| BEAMS | 34366 | 6896 |
| COLUMNS | 22337 | 4533 |
| WALLS | 292048 | 39916 |
| | 746122.02 | 116786.43 |

CENTER OF MASS X = 181.76
CENTER OF MASS Y = 28.45

Total center of mass X = 181.80
Total center of mass Y = 28.58

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 358 -- 2ND FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 7,555.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.80 ft |
| X-X Axis Shear | 7,555.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.58 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 8.230 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 9.950 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 12.600 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 12.600 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 13.860 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 14.230 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 13.860 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.997 | 3,408.483 | 105.828 | 3,514.311 |
| 2 | 8.997 | 4,126.438 | -105.882 | 4,126.438 |
| 3 | -18.090 | 1,396.267 | 272.032 | 1,668.299 |
| 4 | 18.243 | 1,396.267 | 274.164 | 1,670.431 |
| 5 | -18.090 | 1,535.894 | 149.801 | 1,685.695 |
| 6 | 18.243 | 1,576.895 | 0.335 | 1,577.231 |
| 7 | 18.243 | 1,535.894 | 150.879 | 1,686.772 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.723 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 22.624 ft | Xcm + .05*Max-X - X-cr = | 18.243 ft | Torsion = | 137827.61 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.090 ft | Torsion = | -136668.21 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.997 ft | Torsion = | 67,974.31 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 2.914 ft | Torsion = | 22,017.25 k-ft |

# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 358 -- 3RD FLOOR DIAPHRAGM

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 5,832.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 181.82 ft |
| X-X Axis Shear | 5,832.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.67 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 6.750 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 7.900 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Fix | 1.0 |
| 3 | 11.700 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 11.700 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 9.240 | 50.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 9.490 | 50.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 9.240 | 50.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.688 | 2,681.026 | 73.532 | 2,754.558 |
| 2 | 8.688 | 3,142.066 | -73.550 | 3,142.066 |
| 3 | -18.062 | 1,314.920 | 224.537 | 1,539.457 |
| 4 | 18.271 | 1,314.920 | 227.022 | 1,541.943 |
| 5 | -18.062 | 1,038.450 | 88.768 | 1,127.218 |
| 6 | 18.271 | 1,066.546 | 0.208 | 1,066.754 |
| 7 | 18.271 | 1,038.450 | 89.701 | 1,128.151 |

## Summary

| | | | | | |
|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.715 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | |
| Y Distance to Center of Rigidity | 23.024 ft | Xcm + .05*Max-X - X-cr = | 18.271 ft | Torsion = | 106559.35 k-ft |
| | | Xcm - .05*Max-X - X-cr = | -18.062 ft | Torsion = | -105334.71 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr = | 8.688 ft | Torsion = | 50,667.47 k-ft |
| | | Ycm - .05*Max-Y - Y-cr = | 2.605 ft | Torsion = | 15,191.41 k-ft |

B209

**Title :** QUAD C **Job #**
**Dsgnr:** **Date:**
**Description :** Renovation of existing 3-story concrete buildings for seismic loads. The roof will be a new metal d
**Scope :** Perform torsional distribution of shear to walls for rigid diaphragm -- floors only.



# Rigid Diaphragm Torsional Analysis



**Description** QUAD C, BUILDING 358 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

## General Information

| | | | | | |
|---|---|---|---|---|---|
| Y-Y Axis Shear | 0.00 k | Min. X Axis Ecc | 5.00 % | X Axis Center of Mass | 182.00 ft |
| X-X Axis Shear | 2,605.00 k | Min. Y Axis Ecc | 5.00 % | Y Axis Center of Mass | 28.54 ft |
| ...Shears are applied on each axis separately | | | | Max X Dimension | 363.33 ft |
| | | | | Max Y Dimension | 60.83 ft |

## Wall Data

| Label | Thickness in | Length ft | Height ft | Wall Xcg ft | Wall Ycg ft | Wall Angle deg CCW | Wall End Fixity | E |
|---|---|---|---|---|---|---|---|---|
| 1 | 5.630 | 363.330 | 12.580 | 182.000 | 50.000 | 0.0 | Fix-Pin | 1.0 |
| 2 | 6.770 | 363.330 | 12.580 | 182.000 | 0.000 | 0.0 | Fix-Pin | 1.0 |
| 3 | 10.230 | 50.000 | 12.580 | 0.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 4 | 10.230 | 50.000 | 12.580 | 363.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 5 | 0.500 | 20.000 | 12.580 | 15.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 6 | 0.500 | 20.000 | 12.580 | 35.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 7 | 0.500 | 20.000 | 12.580 | 55.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 8 | 0.500 | 20.000 | 12.580 | 75.670 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 9 | 0.500 | 20.000 | 12.580 | 90.750 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 10 | 0.500 | 20.000 | 12.580 | 106.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 11 | 0.500 | 20.000 | 12.580 | 126.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 12 | 0.500 | 20.000 | 12.580 | 146.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 13 | 0.500 | 20.000 | 12.580 | 166.330 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 14 | 0.500 | 20.000 | 12.580 | 181.920 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 15 | 0.500 | 20.000 | 12.580 | 197.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 16 | 0.500 | 20.000 | 12.580 | 217.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 17 | 0.500 | 20.000 | 12.580 | 237.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 18 | 0.500 | 20.000 | 12.580 | 257.000 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 19 | 0.500 | 20.000 | 12.580 | 272.580 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 20 | 0.500 | 20.000 | 12.580 | 287.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 21 | 0.500 | 20.000 | 12.580 | 307.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 22 | 0.500 | 20.000 | 12.580 | 327.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |
| 23 | 0.500 | 20.000 | 12.580 | 347.660 | 25.000 | 90.0 | Fix-Pin | 1.0 |

## Calculated Wall Forces

| Label | Govern Ecc. for Max Torsion ft | Direct Shear k | Torsional Shear k | **Final Max. Wall Shear k** |
|---|---|---|---|---|
| 1 | 8.878 | 1,181.941 | 37.069 | 1,219.010 |
| 2 | 8.878 | 1,421.269 | -37.074 | 1,421.269 |
| 3 | 8.878 | 0.895 | 55.505 | 56.400 |
| 4 | 8.878 | 0.895 | 55.503 | 56.398 |
| 5 | 8.878 | 0.000 | 0.690 | 0.690 |
| 6 | 8.878 | 0.000 | 0.607 | 0.607 |
| 7 | 8.878 | 0.000 | 0.524 | 0.524 |
| 8 | 8.878 | 0.000 | 0.441 | 0.441 |
| 9 | 8.878 | 0.000 | 0.378 | 0.378 |
| 10 | 8.878 | 0.000 | 0.313 | 0.313 |
| 11 | 8.878 | 0.000 | 0.230 | 0.230 |
| 12 | 8.878 | 0.000 | 0.147 | 0.147 |
| 13 | 8.878 | 0.000 | 0.064 | 0.064 |

**Description** QUAD C, BUILDING 358 -- ROOF DIAPHRAGM IN LONGITUDINAL DIRECTION

| | | | | |
|---|---|---|---|---|
| 14 | 8.878 | 0.000 | 0.001 | 0.001 |
| 15 | 8.878 | 0.000 | 0.064 | 0.064 |
| 16 | 8.878 | 0.000 | 0.147 | 0.147 |
| 17 | 8.878 | 0.000 | 0.230 | 0.230 |
| 18 | 8.878 | 0.000 | 0.313 | 0.313 |
| 19 | 8.878 | 0.000 | 0.378 | 0.378 |
| 20 | 8.878 | 0.000 | 0.441 | 0.441 |
| 21 | 8.878 | 0.000 | 0.524 | 0.524 |
| 22 | 8.878 | 0.000 | 0.607 | 0.607 |
| 23 | 8.878 | 0.000 | 0.690 | 0.690 |

## Summary

| | | | | | | |
|---|---|---|---|---|---|---|
| X Distance to Center of Rigidity | 181.668 ft | Controlling Eccentricities & Forces from Applied Y-Y Shear | | | | |
| Y Distance to Center of Rigidity | 22.703 ft | Xcm + .05*Max-X - X-cr | = | 18.498 ft | Torsion = | 0.00 k-ft |
| | | Xcm - .05*Max-X - X-cr | = | -17.835 ft | Torsion = | 0.00 k-ft |
| X Accidental Eccentricity | 18.167 ft | Controlling Eccentricities & Forces from Applied X-X Shear | | | | |
| Y Accidental Eccentricity | 3.042 ft | Ycm + .05*Max-Y - Y-cr | = | 8.878 ft | Torsion = | 23,127.99 k-ft |
| | | Ycm - .05*Max-Y - Y-cr | = | 2.795 ft | Torsion = | 7,281.78 k-ft |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/03/03
TIME: 11:15 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: GROUND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 97119 | 97119 | 0.315 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.151 |
| PIER (17-29) | | | | | 0.000 | 0 | 100599 | 100599 | 0.326 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 32046 | 32046 | 0.104 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 308232 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 264861 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 1 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| PIER 2 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 64399 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32046 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 123.67 | 0.036 | 367541 | 0 | 367541 | NA |
| PIER 3 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 4 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 5 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 6 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 7 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 8 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.018 |
| PIER 9 | FIXED | 12.00 | 4.50 | 5.83 | 0.772 | 14293 | 0 | 14293 | 0.099 |
| PIER 10 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 11 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 12 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 13 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 14 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| PIER 15 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 143679 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 97119 | (K/IN) |

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 125.67 | 0.036 | 373490 | 0 | 373490 | NA |
| PIER 17 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 18 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 19 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 20 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 21 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 22 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 23 | FIXED | 12.00 | 4.50 | 7.83 | 0.575 | 20825 | 0 | 20825 | 0.139 |
| PIER 24 | FIXED | 12.00 | 4.50 | 2.17 | 2.074 | 2544 | 0 | 2544 | 0.017 |
| PIER 25 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 26 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 27 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 28 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| PIER 29 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.077 |
| | | | | | TOTAL (PIERS ONLY) = | | | 150210 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 100599 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 4.50 | 28.17 | 0.160 | 83003 | 0 | 83003 | NA |
| PIER 30 | FIXED | 12.00 | 4.50 | 5.00 | 0.900 | 11531 | 0 | 11531 | 0.179 |
| PIER 31 | FIXED | 12.00 | 4.50 | 18.17 | 0.248 | 52868 | 0 | 52868 | 0.821 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 64399 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 32046 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 8.23 | 12.58 | 363.33 | 0.035 | 264918 | 0 | 264918 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 264918 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:05 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3514 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3514.00 | 12.00 | 4353.96 | 12797.98 | 44206.1 | 0.81 |
| PIER (1-2) | 0.104 | 365.3 | 12.00 | 335.04 | 984.81 | 3653.3 | 0.87 |
| PIER (3-15) | 0.315 | 1107.2 | 12.00 | 1481.04 | 4353.35 | 11072.1 | 0.60 |
| PIER 16 | 0.151 | 529.3 | 12.00 | 425.04 | 1249.36 | 5292.5 | 1.00 |
| PIER (17-29) | 0.326 | 1146.9 | 12.00 | 1505.04 | 4423.90 | 11468.7 | 0.61 |
| PIER (30-31) | 0.104 | 365.3 | 12.00 | 335.04 | 984.81 | 3653.3 | 0.87 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 3514.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.821 | 299.9 | 12.00 | 215.04 | 632.09 | 674.82 | 0.25 |
| PIER 2 | 0.179 | 65.4 | 12.00 | 57.00 | 167.55 | 147.19 | 0.21 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 365.3 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 4 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 5 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 6 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 7 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 8 | 0.018 | 19.6 | 12.00 | 23.04 | 67.72 | 44.12 | 0.15 |
| PIER 9 | 0.099 | 110.1 | 12.00 | 66.96 | 196.82 | 247.83 | 0.30 |
| PIER 10 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 11 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 12 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 13 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 14 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| PIER 15 | 0.080 | 88.9 | 12.00 | 57.00 | 167.55 | 199.93 | 0.28 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 1107.2 | | | | | |

B214

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 18 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 19 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 20 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 21 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 22 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 23 | 0.139 | 159.0 | 12.00 | 90.96 | 267.37 | 357.75 | 0.32 |
| PIER 24 | 0.017 | 19.4 | 12.00 | 23.04 | 67.72 | 43.71 | 0.15 |
| PIER 25 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 26 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 27 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 28 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| PIER 29 | 0.077 | 88.0 | 12.00 | 57.00 | 167.55 | 198.09 | 0.28 |
| | 1.000 | 1146.9 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.179 | 65.4 | 12.00 | 57.00 | 167.55 | 147.19 | 0.21 |
| PIER 31 | 0.821 | 299.9 | 12.00 | 215.04 | 632.09 | 674.82 | 0.25 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 365.3 | | | | | |

B215

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/03/03
TIME: 11:13 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 2ND FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 12.58 | 363.33 | 0.035 | 386272 | 0 | 386272 | NA |
| SOLID STRIP | FIXED | 12.00 | 10.00 | 363.33 | 0.028 | 486007 | 0 | 486007 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 68357 | 68357 | 0.278 |
| PIER 16 | FIXED | 12.00 | 10.00 | 35.67 | 0.280 | 46424 | 0 | 46424 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 71882 | 71882 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 29536 | 29536 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 245735 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 217359 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| PIER 2 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 42186 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 29536 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 123.67 | 0.081 | 165086 | 0 | 165086 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 123.67 | 0.053 | 254321 | 0 | 254321 | NA |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 8 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 9 | FIXED | 12.00 | 6.50 | 5.83 | 1.115 | 8311 | 0 | 8311 | 0.104 |
| PIER 10 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 79976 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 68357 | (K/IN) |

B 2/4

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 125.67 | 0.080 | 167768 | 0 | 167768 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 125.67 | 0.052 | 258441 | 0 | 258441 | NA |
| PIER 17 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 23 | FIXED | 12.00 | 6.50 | 7.83 | 0.830 | 12934 | 0 | 12934 | 0.153 |
| PIER 24 | FIXED | 12.00 | 6.50 | 2.17 | 2.995 | 1062 | 0 | 1062 | 0.013 |
| PIER 25 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 26 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.076 |
| | | | | | TOTAL (PIERS ONLY) = | | | 84599 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 71882 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.00 | 10.00 | 28.17 | 0.355 | 36068 | 0 | 36068 | NA |
| SOLID STRIP | FIXED | 12.00 | 6.50 | 28.17 | 0.231 | 56905 | 0 | 56905 | NA |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.152 |
| PIER 31 | FIXED | 12.00 | 6.50 | 18.17 | 0.358 | 35768 | 0 | 35768 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 42186 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 29536 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 6.75 | 12.58 | 363.33 | 0.035 | 217278 | 0 | 217278 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217278 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 06:51 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 2755 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 2755.00 | 12.00 | 4353.96 | 12797.98 | 34657.9 | 0.64 |
| PIER (1-2) | 0.120 | 331.1 | 12.00 | 335.04 | 984.81 | 3311.4 | 0.79 |
| PIER (3-15) | 0.278 | 766.4 | 12.00 | 1481.04 | 4353.35 | 7663.6 | 0.41 |
| PIER 16 | 0.189 | 520.5 | 12.00 | 425.04 | 1249.36 | 5204.7 | 0.98 |
| PIER (17-29) | 0.293 | 805.9 | 12.00 | 1505.04 | 4423.90 | 8058.9 | 0.43 |
| PIER (30-31) | 0.120 | 331.1 | 12.00 | 335.04 | 984.81 | 3311.4 | 0.79 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 2755.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 280.8 | 12.00 | 215.04 | 632.09 | 912.47 | 0.34 |
| PIER 2 | 0.152 | 50.4 | 12.00 | 57.00 | 167.55 | 163.74 | 0.23 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 331.1 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 4 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 5 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 6 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 7 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 8 | 0.013 | 10.2 | 12.00 | 23.04 | 67.72 | 33.09 | 0.12 |
| PIER 9 | 0.104 | 79.6 | 12.00 | 66.96 | 196.82 | 258.83 | 0.31 |
| PIER 10 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 11 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 12 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 13 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 14 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| PIER 15 | 0.080 | 61.5 | 12.00 | 57.00 | 167.55 | 199.89 | 0.28 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 766.4 | | | | | |

B218

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 18 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 19 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 20 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 21 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 22 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 23 | 0.153 | 123.2 | 12.00 | 90.96 | 267.37 | 400.44 | 0.35 |
| PIER 24 | 0.013 | 10.1 | 12.00 | 23.04 | 67.72 | 32.89 | 0.11 |
| PIER 25 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 26 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 27 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 28 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| PIER 29 | 0.076 | 61.1 | 12.00 | 57.00 | 167.55 | 198.71 | 0.28 |
| | 1.000 | 805.9 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 50.4 | 12.00 | 57.00 | 167.55 | 163.74 | 0.23 |
| PIER 31 | 0.848 | 280.8 | 12.00 | 215.04 | 632.09 | 912.47 | 0.34 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 331.1 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/03/03
TIME: 11:11 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS

WALL PORTION: 3RD FLOOR FRONT WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.00 | 12.58 | 363.33 | 0.035 | 321481 | 0 | 321481 | NA |
| SOLID STRIP | CANT | 10.00 | 10.00 | 363.33 | 0.028 | 404677 | 0 | 404677 | NA |
| PIER (1-2) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| PIER (3-15) | FIXED | | | | 0.000 | 0 | 56964 | 56964 | 0.278 |
| PIER 16 | FIXED | 10.00 | 10.00 | 35.67 | 0.280 | 38686 | 0 | 38686 | 0.189 |
| PIER (17-29) | | | | | 0.000 | 0 | 59902 | 59902 | 0.293 |
| PIER (30-31) | FIXED | | | | 0.000 | 0 | 24614 | 24614 | 0.120 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 204779 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 181067 | (K/IN) |

WALL PORTION: PIER (1-2)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 1 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| PIER 2 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 35155 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 24614 | (K/IN) |

WALL PORTION: PIER (3-15)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 123.67 | 0.081 | 137572 | 0 | 137572 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 123.67 | 0.053 | 211934 | 0 | 211934 | NA |
| PIER 3 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 4 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 5 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 6 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 7 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 8 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 9 | FIXED | 10.00 | 6.50 | 5.83 | 1.115 | 6926 | 0 | 6926 | 0.104 |
| PIER 10 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 11 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 12 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 13 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 14 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| PIER 15 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.080 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 66647 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 56964 | (K/IN) |

B 220

WALL PORTION: PIER (17-29)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 125.67 | 0.080 | 139807 | 0 | 139807 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 125.67 | 0.052 | 215368 | 0 | 215368 | NA |
| PIER 17 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 18 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 19 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 20 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 21 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 22 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 23 | FIXED | 10.00 | 6.50 | 7.83 | 0.830 | 10779 | 0 | 10779 | 0.153 |
| PIER 24 | FIXED | 10.00 | 6.50 | 2.17 | 2.995 | 885 | 0 | 885 | 0.013 |
| PIER 25 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 26 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 27 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 28 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| PIER 29 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.076 |
| | | | | | TOTAL (PIERS ONLY) = | | | 70499 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 59902 | (K/IN) |

WALL PORTION: PIER (30-31)

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 10.00 | 28.17 | 0.355 | 30057 | 0 | 30057 | NA |
| SOLID STRIP | FIXED | 10.00 | 6.50 | 28.17 | 0.231 | 47421 | 0 | 47421 | NA |
| PIER 30 | FIXED | 10.00 | 6.50 | 5.00 | 1.300 | 5349 | 0 | 5349 | 0.152 |
| PIER 31 | FIXED | 10.00 | 6.50 | 18.17 | 0.358 | 29806 | 0 | 29806 | 0.848 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 35155 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 24614 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 5.63 | 12.58 | 363.33 | 0.035 | 180994 | 0 | 180994 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 180994 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:30 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1219 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR FRONT WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1219.00 | 10.00 | 4353.96 | 10664.98 | 15335.0 | 0.28 |
| PIER (1-2) | 0.120 | 146.5 | 10.00 | 335.04 | 820.68 | 1465.2 | 0.35 |
| PIER (3-15) | 0.278 | 339.1 | 10.00 | 1481.04 | 3627.79 | 3390.9 | 0.18 |
| PIER 16 | 0.189 | 230.3 | 10.00 | 425.04 | 1041.13 | 2302.9 | 0.43 |
| PIER (17-29) | 0.293 | 356.6 | 10.00 | 1505.04 | 3686.58 | 3565.8 | 0.19 |
| PIER (30-31) | 0.120 | 146.5 | 10.00 | 335.04 | 820.68 | 1465.2 | 0.35 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1219.0 | | | | | |

WALL PORTION: PIER (1-2)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 1 | 0.848 | 124.2 | 10.00 | 215.04 | 526.74 | 403.74 | 0.12 |
| PIER 2 | 0.152 | 22.3 | 10.00 | 57.00 | 139.62 | 72.45 | 0.08 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 146.5 | | | | | |

WALL PORTION: PIER (3-15)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 3 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 4 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 5 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 6 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 7 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 8 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.64 | 0.04 |
| PIER 9 | 0.104 | 35.2 | 10.00 | 66.96 | 164.02 | 114.53 | 0.11 |
| PIER 10 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 11 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 12 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 13 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 14 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| PIER 15 | 0.080 | 27.2 | 10.00 | 57.00 | 139.62 | 88.44 | 0.10 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | | 339.1 | | | | | |

WALL PORTION: PIER (17-29)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 17 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 18 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 19 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 20 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 21 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 22 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 23 | 0.153 | 54.5 | 10.00 | 90.96 | 222.81 | 177.18 | 0.12 |
| PIER 24 | 0.013 | 4.5 | 10.00 | 23.04 | 56.44 | 14.55 | 0.04 |
| PIER 25 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 26 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 27 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 28 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| PIER 29 | 0.076 | 27.1 | 10.00 | 57.00 | 139.62 | 87.92 | 0.10 |
| | 1.000 | 356.6 | | | | | |

WALL PORTION: PIER (30-31)

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| PIER 30 | 0.152 | 22.3 | 10.00 | 57.00 | 139.62 | 72.45 | 0.08 |
| PIER 31 | 0.848 | 124.2 | 10.00 | 215.04 | 526.74 | 403.74 | 0.12 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | 1.000 | 146.5 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 01/30/03
TIME: 09:31 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 363.33 | 0.035 | 450651 | 0 | 450651 | NA |
| SOLID STRIP | FIXED | 14.00 | 4.50 | 363.33 | 0.012 | 1260290 | 0 | 1260290 | NA |
| PIER 1 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| PIER 2 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| PIER 3 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 4 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 5 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 6 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 7 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 8 | FIXED | 14.00 | 4.50 | 7.67 | 0.587 | 23694 | 0 | 23694 | 0.040 |
| PIER 9 | FIXED | 14.00 | 4.50 | 11.00 | 0.409 | 36006 | 0 | 36006 | 0.061 |
| PIER 10 | FIXED | 14.00 | 4.50 | 7.67 | 0.587 | 23694 | 0 | 23694 | 0.040 |
| PIER 11 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 12 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 13 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 14 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 15 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 16 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| PIER 17 | FIXED | 14.00 | 4.50 | 12.17 | 0.370 | 40251 | 0 | 40251 | 0.068 |
| PIER 18 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| PIER 19 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 20 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 21 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 22 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 23 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 24 | FIXED | 14.00 | 4.50 | 7.67 | 0.587 | 23694 | 0 | 23694 | 0.040 |
| PIER 25 | FIXED | 14.00 | 4.50 | 11.00 | 0.409 | 36006 | 0 | 36006 | 0.061 |
| PIER 26 | FIXED | 14.00 | 4.50 | 7.67 | 0.587 | 23694 | 0 | 23694 | 0.040 |
| PIER 27 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 28 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 29 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 30 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 31 | FIXED | 14.00 | 4.50 | 5.00 | 0.900 | 13453 | 0 | 13453 | 0.023 |
| PIER 32 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| PIER 33 | FIXED | 14.00 | 4.50 | 6.42 | 0.701 | 18946 | 0 | 18946 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 11.80

TOTAL (PIERS ONLY) = 589771 1.000
WALL RIGIDITY = 320398 (K/IN)

B224

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.95 | 12.58 | 363.33 | 0.035 | 320284 | 0 | 320284 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 320284 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 06:36 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 4126 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 4126.00 | 14.00 | 4353.96 | 14930.97 | 51905.1 | 0.95 |
| PIER 1 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| PIER 2 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| PIER 3 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 4 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 5 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 6 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 7 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 8 | 0.040 | 165.8 | 14.00 | 89.04 | 305.34 | 373.0 | 0.34 |
| PIER 9 | 0.061 | 251.9 | 14.00 | 129.00 | 442.38 | 566.8 | 0.35 |
| PIER 10 | 0.040 | 165.8 | 14.00 | 89.04 | 305.34 | 373.0 | 0.34 |
| PIER 11 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 12 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 13 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 14 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 15 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 16 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| PIER 17 | 0.068 | 281.6 | 14.00 | 143.04 | 490.53 | 633.6 | 0.36 |
| PIER 18 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| PIER 19 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 20 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 21 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 22 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 23 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 24 | 0.040 | 165.8 | 14.00 | 89.04 | 305.34 | 373.0 | 0.34 |
| PIER 25 | 0.061 | 251.9 | 14.00 | 129.00 | 442.38 | 566.8 | 0.35 |
| PIER 26 | 0.040 | 165.8 | 14.00 | 89.04 | 305.34 | 373.0 | 0.34 |
| PIER 27 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 28 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 29 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 30 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 31 | 0.023 | 94.1 | 14.00 | 57.00 | 195.47 | 211.8 | 0.30 |
| PIER 32 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| PIER 33 | 0.032 | 132.5 | 14.00 | 74.04 | 253.90 | 298.2 | 0.32 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 4126.0 | | | | | |

B226

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 01/30/03
TIME: 09:32 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 363.33 | 0.035 | 450651 | 0 | 450651 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 363.33 | 0.018 | 872456 | 0 | 872456 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 2 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 3 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 4 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 5 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 6 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 7 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 8 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 9 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.067 |
| PIER 10 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 11 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 12 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 13 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 14 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 15 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 16 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 17 | FIXED | 14.00 | 6.50 | 12.17 | 0.534 | 26525 | 0 | 26525 | 0.076 |
| PIER 18 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 19 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 20 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 21 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 22 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 23 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 24 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 25 | FIXED | 14.00 | 6.50 | 11.00 | 0.591 | 23488 | 0 | 23488 | 0.067 |
| PIER 26 | FIXED | 14.00 | 6.50 | 7.67 | 0.847 | 14660 | 0 | 14660 | 0.042 |
| PIER 27 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 28 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 29 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 30 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 31 | FIXED | 14.00 | 6.50 | 5.00 | 1.300 | 7488 | 0 | 7488 | 0.021 |
| PIER 32 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| PIER 33 | FIXED | 14.00 | 6.50 | 6.42 | 1.012 | 11286 | 0 | 11286 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 10.82

TOTAL (PIERS ONLY) = 349619 1.000
WALL RIGIDITY = 254254 (K/IN)

B227

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.90 | 12.58 | 363.33 | 0.035 | 254296 | 0 | 254296 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 254296 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 06:47 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 3142 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 3142.00 | 14.00 | 4353.96 | 14930.97 | 39526.4 | 0.73 |
| PIER 1 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| PIER 2 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| PIER 3 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 4 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 5 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 6 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 7 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 8 | 0.042 | 131.7 | 14.00 | 89.04 | 305.34 | 428.2 | 0.39 |
| PIER 9 | 0.067 | 211.1 | 14.00 | 129.00 | 442.38 | 686.0 | 0.43 |
| PIER 10 | 0.042 | 131.7 | 14.00 | 89.04 | 305.34 | 428.2 | 0.39 |
| PIER 11 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 12 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 13 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 14 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 15 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 16 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| PIER 17 | 0.076 | 238.4 | 14.00 | 143.04 | 490.53 | 774.7 | 0.43 |
| PIER 18 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| PIER 19 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 20 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 21 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 22 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 23 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 24 | 0.042 | 131.7 | 14.00 | 89.04 | 305.34 | 428.2 | 0.39 |
| PIER 25 | 0.067 | 211.1 | 14.00 | 129.00 | 442.38 | 686.0 | 0.43 |
| PIER 26 | 0.042 | 131.7 | 14.00 | 89.04 | 305.34 | 428.2 | 0.39 |
| PIER 27 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 28 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 29 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 30 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 31 | 0.021 | 67.3 | 14.00 | 57.00 | 195.47 | 218.7 | 0.31 |
| PIER 32 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| PIER 33 | 0.032 | 101.4 | 14.00 | 74.04 | 253.90 | 329.6 | 0.36 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 3142.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 01/30/03
TIME: 09:32 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR BACK WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 363.33 | 0.035 | 385777 | 0 | 385777 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 363.33 | 0.018 | 747563 | 0 | 747563 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 2 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 3 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 4 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 5 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 6 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 7 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 8 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 9 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 10 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 11 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 12 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 13 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 14 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 15 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 16 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 17 | FIXED | 12.00 | 6.50 | 12.17 | 0.534 | 22735 | 0 | 22735 | 0.076 |
| PIER 18 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 19 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 20 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 21 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 22 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 23 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 24 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 25 | FIXED | 12.00 | 6.50 | 11.00 | 0.591 | 20133 | 0 | 20133 | 0.067 |
| PIER 26 | FIXED | 12.00 | 6.50 | 7.67 | 0.847 | 12566 | 0 | 12566 | 0.042 |
| PIER 27 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 28 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 29 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 30 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 31 | FIXED | 12.00 | 6.50 | 5.00 | 1.300 | 6418 | 0 | 6418 | 0.021 |
| PIER 32 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| PIER 33 | FIXED | 12.00 | 6.50 | 6.42 | 1.012 | 9674 | 0 | 9674 | 0.032 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |

Lremain = 203.37
THKred = 9.27

TOTAL (PIERS ONLY) = 299674 1.000
WALL RIGIDITY = 217796 (K/IN)

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 6.77 | 12.58 | 363.33 | 0.035 | 217771 | 0 | 217771 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 217771 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 06:44 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1421 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR BACK WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1421.00 | 12.00 | 4353.96 | 12797.98 | 17876.2 | 0.33 |
| PIER 1 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| PIER 2 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| PIER 3 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 4 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 5 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 6 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 7 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 8 | 0.042 | 59.6 | 12.00 | 89.04 | 261.72 | 193.6 | 0.17 |
| PIER 9 | 0.067 | 95.5 | 12.00 | 129.00 | 379.18 | 310.3 | 0.19 |
| PIER 10 | 0.042 | 59.6 | 12.00 | 89.04 | 261.72 | 193.6 | 0.17 |
| PIER 11 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 12 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 13 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 14 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 15 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 16 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| PIER 17 | 0.076 | 107.8 | 12.00 | 143.04 | 420.45 | 350.4 | 0.20 |
| PIER 18 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| PIER 19 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 20 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 21 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 22 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 23 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 24 | 0.042 | 59.6 | 12.00 | 89.04 | 261.72 | 193.6 | 0.17 |
| PIER 25 | 0.067 | 95.5 | 12.00 | 129.00 | 379.18 | 310.3 | 0.19 |
| PIER 26 | 0.042 | 59.6 | 12.00 | 89.04 | 261.72 | 193.6 | 0.17 |
| PIER 27 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 28 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 29 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 30 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 31 | 0.021 | 30.4 | 12.00 | 57.00 | 167.55 | 98.9 | 0.14 |
| PIER 32 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| PIER 33 | 0.032 | 45.9 | 12.00 | 74.04 | 217.63 | 149.1 | 0.16 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1421.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 03:56 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 4.50 | 50.00 | 0.090 | 172945 | 0 | 172945 | NA |
| PIER 1 | FIXED | 14.00 | 4.50 | 6.33 | 0.711 | 18601 | 0 | 18601 | 0.142 |
| PIER 2 | FIXED | 14.00 | 4.50 | 27.33 | 0.165 | 93896 | 0 | 93896 | 0.716 |
| PIER 3 | FIXED | 14.00 | 4.50 | 6.33 | 0.711 | 18601 | 0 | 18601 | 0.142 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 131098 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 54562 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 12.60 | 12.58 | 50.00 | 0.252 | 54604 | 0 | 54604 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 54604 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 03:56 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1670 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: GROUND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1670.00 | 14.00 | 594.00 | 2037.00 | 21008.6 | 2.84 |
| PIER 1 | 0.142 | 236.9 | 14.00 | 72.96 | 250.20 | 533.1 | 0.59 |
| PIER 2 | 0.716 | 1196.1 | 14.00 | 324.96 | 1114.38 | 2691.2 | 0.66 |
| PIER 3 | 0.142 | 236.9 | 14.00 | 72.96 | 250.20 | 533.1 | 0.59 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | | 1670.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:17 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 2ND FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.00 | 12.58 | 50.00 | 0.252 | 60672 | 0 | 60672 | NA |
| SOLID STRIP | FIXED | 14.00 | 6.50 | 50.00 | 0.130 | 119357 | 0 | 119357 | NA |
| PIER 1 | FIXED | 14.00 | 6.50 | 6.33 | 1.027 | 11043 | 0 | 11043 | 0.128 |
| PIER 2 | FIXED | 14.00 | 6.50 | 27.33 | 0.238 | 64335 | 0 | 64335 | 0.744 |
| PIER 3 | FIXED | 14.00 | 6.50 | 6.33 | 1.027 | 11043 | 0 | 11043 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 86421 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 50825 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 11.70 | 12.58 | 50.00 | 0.252 | 50704 | 0 | 50704 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 50704 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 07:01 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1542 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 2ND FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1542.00 | 14.00 | 594.00 | 2037.00 | 19398.4 | 2.62 |
| PIER 1 | 0.128 | 197.0 | 14.00 | 72.96 | 250.20 | 640.4 | 0.71 |
| PIER 2 | 0.744 | 1147.9 | 14.00 | 324.96 | 1114.38 | 3730.7 | 0.92 |
| PIER 3 | 0.128 | 197.0 | 14.00 | 72.96 | 250.20 | 640.4 | 0.71 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 1542.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 01/29/03
TIME: 06:27 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: 3RD FLOOR SIDE WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 12.00 | 12.58 | 50.00 | 0.252 | 48770 | 0 | 48770 | NA |
| SOLID STRIP | CANT | 12.00 | 6.50 | 50.00 | 0.130 | 100497 | 0 | 100497 | NA |
| PIER 1 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| PIER 2 | FIXED | 12.00 | 6.50 | 27.33 | 0.238 | 55144 | 0 | 55144 | 0.744 |
| PIER 3 | FIXED | 12.00 | 6.50 | 6.33 | 1.027 | 9466 | 0 | 9466 | 0.128 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | 0.000 | 0 | | | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 74075 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41573 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 10.23 | 12.58 | 50.00 | 0.252 | 41576 | 0 | 41576 | NA |
| SOLID STRIP | CANT | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41576 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/05/03
TIME: 07:03 AM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 56.4 KIPS

*<< Use Grade 60 reinforcing in added shotcrete >>*

WALL PORTION: 3RD FLOOR SIDE WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 56.40 | 12.00 | 594.00 | 1746.00 | 709.5 | 0.10 |
| PIER 1 | 0.128 | 7.2 | 12.00 | 72.96 | 214.46 | 23.4 | 0.03 |
| PIER 2 | 0.744 | 42.0 | 12.00 | 324.96 | 955.18 | 136.5 | 0.03 |
| PIER 3 | 0.128 | 7.2 | 12.00 | 72.96 | 214.46 | 23.4 | 0.03 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | 0.00 | 0.00 | 0.0 | 0.00 |
| | 1.000 | 56.4 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 03:59 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 15.00 | 12.58 | 50.00 | 0.252 | 65005 | 0 | 65005 | NA |
| SOLID STRIP | FIXED | 15.00 | 7.00 | 50.00 | 0.140 | 118635 | 0 | 118635 | NA |
| PIER 1 | FIXED | 15.00 | 7.00 | 22.33 | 0.313 | 51544 | 0 | 51544 | 0.500 |
| PIER 2 | FIXED | 15.00 | 7.00 | 22.33 | 0.313 | 51544 | 0 | 51544 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 103088 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 60044 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 13.86 | 12.58 | 50.00 | 0.252 | 60065 | 0 | 60065 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 60065 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 03:59 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1687 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1687.00 | 15.00 | 594.00 | 2182.50 | 21222.5 | 2.87 |
| PIER 1 | 0.500 | 843.5 | 15.00 | 264.96 | 973.53 | 5904.5 | 1.79 |
| PIER 2 | 0.500 | 843.5 | 15.00 | 264.96 | 973.53 | 5904.5 | 1.79 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1687.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:20 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 22.33 | 0.313 | 34363 | 0 | 34363 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 68725 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 40029 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.24 | 12.58 | 50.00 | 0.252 | 40043 | 0 | 40043 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 40043 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:20 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1128 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1128.00 | 10.00 | 594.00 | 1455.00 | 14190.2 | 1.92 |
| PIER 1 | 0.500 | 564.0 | 10.00 | 264.96 | 649.02 | 3948.0 | 1.20 |
| PIER 2 | 0.500 | 564.0 | 10.00 | 264.96 | 649.02 | 3948.0 | 1.20 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1128.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:24 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 22.33 | 0.313 | 27490 | 0 | 27490 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 54980 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 30478 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.03 | 12.58 | 50.00 | 0.252 | 30466 | 0 | 30466 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 30466 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:01 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 15.00 | 12.58 | 50.00 | 0.252 | 65005 | 0 | 65005 | NA |
| SOLID STRIP | FIXED | 15.00 | 7.00 | 50.00 | 0.140 | 118635 | 0 | 118635 | NA |
| PIER 1 | FIXED | 15.00 | 7.00 | 23.33 | 0.300 | 54006 | 0 | 54006 | 0.500 |
| PIER 2 | FIXED | 15.00 | 7.00 | 23.33 | 0.300 | 54006 | 0 | 54006 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 108012 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 61681 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 14.23 | 12.58 | 50.00 | 0.252 | 61668 | 0 | 61668 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 61668 | (K/IN) |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:01 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1577 KIPS

WALL PORTION: GROUND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1577.00 | 15.00 | 594.00 | 2182.50 | 19838.7 | 2.68 |
| PIER 1 | 0.500 | 788.5 | 15.00 | 276.96 | 1017.62 | 5519.5 | 1.60 |
| PIER 2 | 0.500 | 788.5 | 15.00 | 276.96 | 1017.62 | 5519.5 | 1.60 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1577.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:21 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 10.00 | 12.58 | 50.00 | 0.252 | 43337 | 0 | 43337 | NA |
| SOLID STRIP | FIXED | 10.00 | 7.00 | 50.00 | 0.140 | 79090 | 0 | 79090 | NA |
| PIER 1 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| PIER 2 | FIXED | 10.00 | 7.00 | 23.33 | 0.300 | 36004 | 0 | 36004 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 72008 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 41121 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 9.49 | 12.58 | 50.00 | 0.252 | 41127 | 0 | 41127 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 41127 | (K/IN) |

RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:21 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH*1.25, F'c OR F'm = 3750 PSI

REINFORCING STRENGTH*1.25, Fy 75000 PSI
SHEAR DEMAND MODIFIER, m = 2
FLEXURE DEMAND MODIFIER, m = 2

TOTAL WALL SHEAR = 1067 KIPS

WALL PORTION: SECOND FLOOR HALLWAY WALL w/ DOOR

| | %R | V, k | b, in | d, in | allow V, k | M, ft-k | AsREQD, in2 |
|---|---|---|---|---|---|---|---|
| SOLID WALL | 1.00 | 1067.00 | 10.00 | 594.00 | 1455.00 | 13422.9 | 1.81 |
| PIER 1 | 0.500 | 533.5 | 10.00 | 276.96 | 678.41 | 3734.5 | 1.08 |
| PIER 2 | 0.500 | 533.5 | 10.00 | 276.96 | 678.41 | 3734.5 | 1.08 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | 0.00 | 0.00 | 0.00 | 0.0 | 0.00 |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | 0.000 | 0.0 | | | | | |
| | | 1067.0 | | | | | |

# RIGIDITY DETERMINATION FOR WALL WITH OPENINGS

PROJECT TITLE: QUAD C
DESCRIPTION: BLDG 358

DATE: 02/04/03
TIME: 04:26 PM

CONCRETE OR MASONRY [C/M] = C
MATERIAL STRENGTH, F'c OR F'm = 3000 PSI

MODULUS OF ELASTICITY = 3122 KSI
SHEAR MODULUS = 1338 KSI

NOTE: CALCULATE R IF PIER IS SOLID. PROVIDE R IF PIER HAS OPENINGS.

WALL PORTION: THIRD FLOOR HALLWAY WALL w/ DOOR

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | CANT | 8.00 | 12.58 | 50.00 | 0.252 | 32513 | 0 | 32513 | NA |
| SOLID STRIP | CANT | 8.00 | 7.00 | 50.00 | 0.140 | 61979 | 0 | 61979 | NA |
| PIER 1 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| PIER 2 | FIXED | 8.00 | 7.00 | 23.33 | 0.300 | 28803 | 0 | 28803 | 0.500 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 57606 | 1.000 |
| | | | | | WALL RIGIDITY = | | | 31268 | (K/IN) |

WALL PORTION: EQUIVALENT SOLID WALL

| MARK | [CANT/ FIXED] | THK (IN) | H (FT) | L (FT) | H/L | CALC R (K/IN) | PROV R (K/IN) | USE R (K/IN) | %R |
|---|---|---|---|---|---|---|---|---|---|
| SOLID WALL | FIXED | 7.22 | 12.58 | 50.00 | 0.252 | 31289 | 0 | 31289 | NA |
| SOLID STRIP | FIXED | 0.00 | 0.00 | 0.00 | 0.000 | 0 | 0 | 0 | NA |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | 0.000 | 0 | 0 | 0 | 0.000 |
| | | | | | TOTAL (PIERS ONLY) = | | | 0 | 0.000 |
| | | | | | WALL RIGIDITY = | | | 31289 | (K/IN) |

ATTACHMENT 11

# FOOD SERVICE DESIGN ANALYSIS

Mizo & Associates, Inc.
Food Facilities Consultants

**WBR Brigade Complex, Phase 3A**
**Quad "C", Schofield Barracks**
**Design Submittal**

**Food Service Narrative**
March 17, 2003

**Design Standard:**

- Standard Definitive Design for Enlisted Personnel Dining Facility (501 – 800 Person A La Carte) used as a guide in developing the floor plan.

**Programmatic Concerns:**

- Standard Definitive Design is directed for construction of new facilities. Quad "C" is a smaller existing facility with Historic Preservation Restraints.
- Existing facility cannot accommodate back of house s.f. requirements of Standard Definitive Design.
- Existing facility cannot accommodate dishwashing layout and flow patterns of Standard Definitive Design.

**Programmatic Design Solutions:**

Based on past experience with Division Food Services the following solutions were incorporated.

- Added soiled tray accumulator system. Existing facility could not accommodate the two soiled drop-off areas per Standard Definitive Design.
- Back of house requirements adjusted to accommodate existing facility.
- Adequate space was not available for carryout kitchen, designed for exterior order and pick-up, snack bar type operation.
- Card access system in lieu of a la carte service (cashier).

**Design Reviews:**

| | | | |
|---|---|---|---|
| Hawaii Review: | MSG Jimmy Neal<br>Food Program Management Office<br>25th ID (L) & USARHAW | Ft. Lee Review: | Wardell Carey<br>Army Center of Excellence, Subsistence<br>Ft. Lee, Virginia |

- MSG Neal design review meetings: 12/13/03, 1/16/03, 2/21/03 & 2/27/03 Final Approval (Refer to attached transmittals for submittal and approval documentation).
- Mizo & Associates request MSG Neal forward plans and equipment brochures to Mr. Wardell Carey for review (Refer to attached transmittals dated 2/21/03 & 2/27/03).
- Mizo & Associates 3/11/03 email to MSG Neal: Any comments from Mr. Carey? If not RFP package will request Contractor to include comments (Refer to attached email).
- MSG Neal email confirmation those drawings sent to Joe McKinney and that plans briefed to unit that will be responsible for the facility.

408 N. Kuakini St, Honolulu, HI 96817 • Ph. (808) 526-1774 • Fax (808) 531-3235

**Mizo & Associates, inc.**
food facilities consultants

408 N. Kuakini Street
Suite 1
Honolulu, HI 96817
Tel. (808) 526-1774
Fax. (808) 531-3235

***TRANSMITTAL***

**To:** Food Program Management Office
25th ID (L) & USARHAW
Bldg. 2071 Schofield Barracks, HI 96857

**Date:** 2/21/03
**Project:** Quad "C"
Schofield Barracks, HI

**Attn.:** MSG Jimmy Neal

**Distribution:** See Below

***We are sending you:***

| Copies | Sheets | Description |
|---|---|---|
| 2 sets | 8 ea. | K-1 thru K-8 Equipment Schedule (Item Description) & Equipment Plans. |
| | | |
| | | |
| | | |

***Comments:***

For your review. Drawings have been revised per our last meeting and marked-up progress drawing dated 10/29/02. I have included 2 sets, one for your records and one for Wardell Carey's review. I will inform the DPW & the Architect that Mr. Carey will be reviewing kitchen plans.

I made a couple of changes to increase the dining seat count. With the revised plan the dining seat count is 300 seats, Standard DFAC Design indicates 372 seats. Is this adequate? My opinion is we're okay since this is an existing facility...please advise. Changes are:

1. Made offices smaller by using part of the area for the vendor office. The total office area ends up approximately 480 sf.
2. Created the enclosed dining area as requested. Space ended up a little larger because of the existing structural bearing wall.

Would you please request a quick turn around time response from Mr. Carey, DPW wants to issue RFP package asap. Once again, thanks for your assistance. Aloha!

Cc: Mitsunaga & Associates, Inc.

Irvin A. Mizo

***Signed:*** Irvin A. Mizo

If enclosures are not as noted, kindly notify us at once.

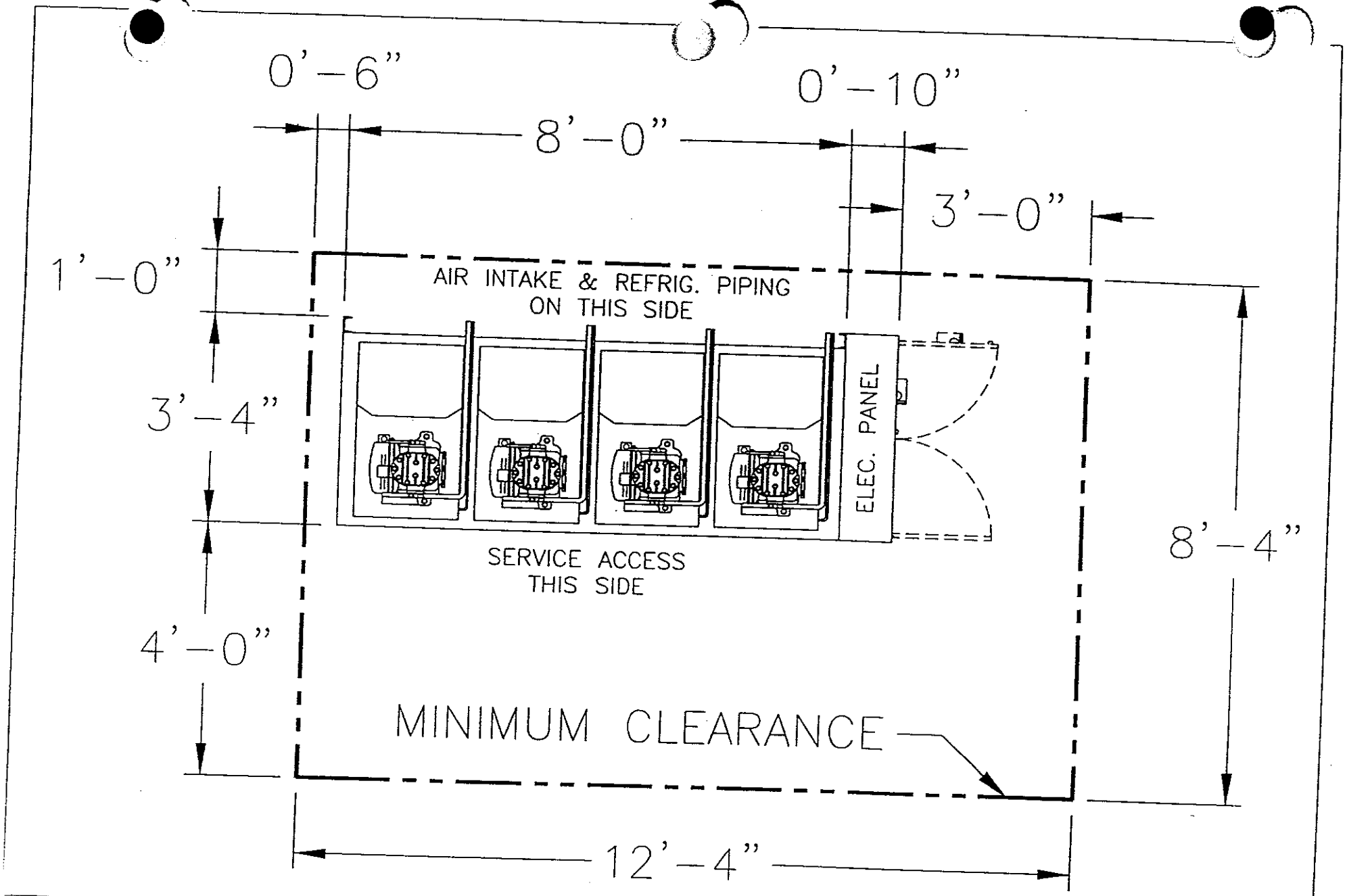
ATTACHMENT 12

# FOOD SERVICE EQUIPMENT BROCHURES

# QUAD "C" RENOVATIONS
# SCHOFIELD BARRACKS

## Food Service Equipment Brochures

February 24, 2003




JOB NAME: **ECA-8D**

SCALE: **NO SCALE**

G:\Drawings\Racks\Eca\Eca8d.Dwg

ColdZone

#6/7

T&S BRASS AND BRONZE WORKS, INC.
2 SADDLEBACK COVE / P.O. BOX 1088 / TRAVELERS REST, SC 29690
PHONE 800-476-4103
FAX 864- 834-3518

REG. ISO 9002

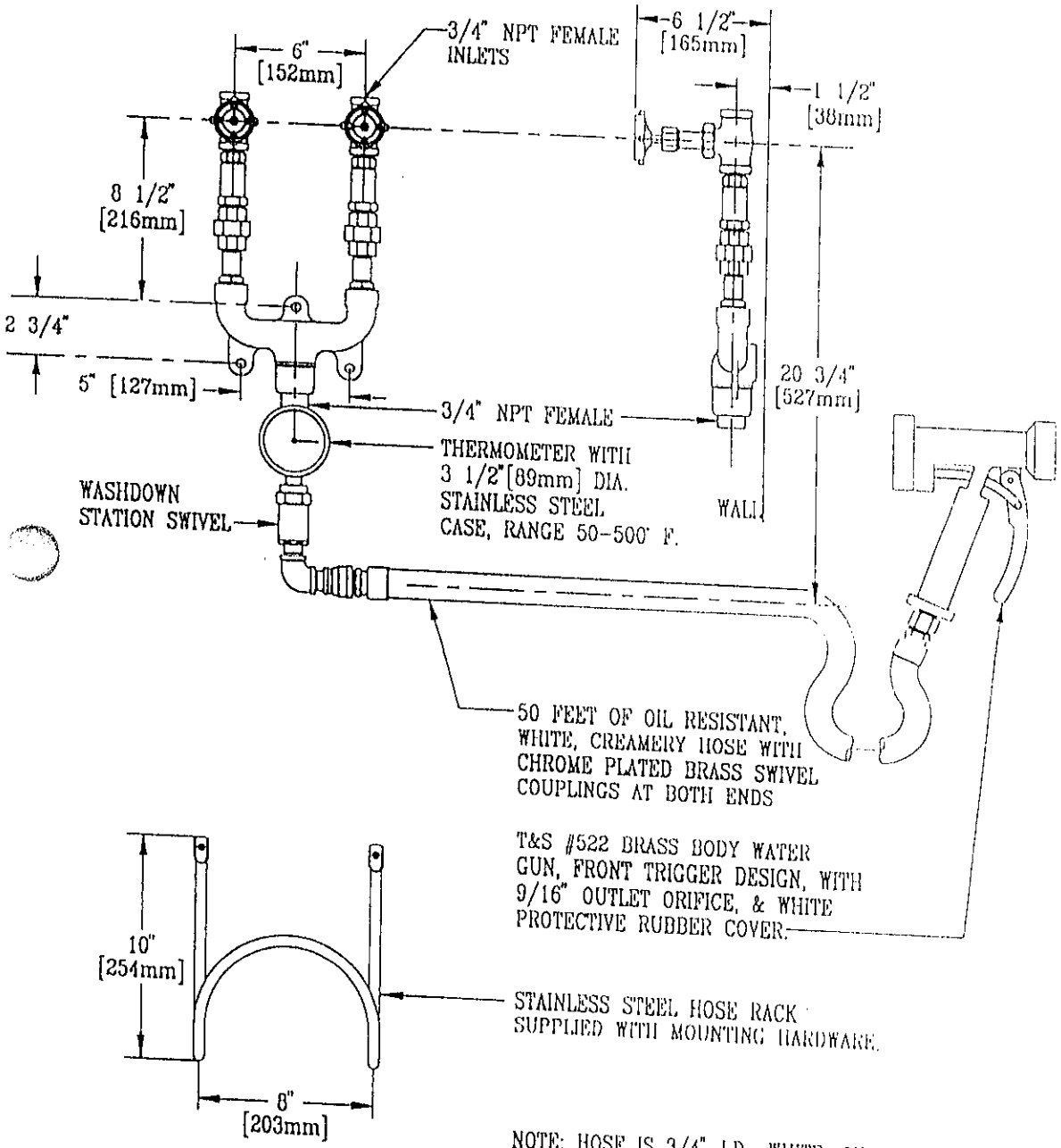
Model No.: B-1451-C1

Item No.: #9

Job Name:

Architect/Engineer Approval:

Notes:




NOTE: HOSE IS 3/4" I.D., WHITE, OIL RESISTANT, 50 FT. LENGTH, EPDM WITH BRAIDED HIGH TENSILE SYNTHETIC TEXTILE CORD. RATED AT 200° F, 200 PSI WORKING PRESSURE, WITH SWIVEL COUPLINGS AT BOTH ENDS.

Product Description:

HOT & COLD WATER WASHDOWN STATION WITH THERMOMETER, MIXING VALVE WITH 3/4" NPT INLETS, 50 FT. HOSE WITH WATER GUN & HOSE RACK.

| Drawn: | Checked | Scale: |
|---|---|---|
| WJS | JKD | 1.5" = 1' |
| Approved | | Date: |
| CA | | 11/22/95 |

10a-e

April 8, 2002

# Kool Star

Three Star Refrigeration Engineering, Inc.

**Manufacturers of Walk-in Cold Storage Coolers & Freezers for Food Service, Hotels, Schools, Hospitals and Institutions**

**15001 South Broadway, Gardena, California 90248**
**TOLL FREE (888) 478-5700**
**Los Angeles (310) 851-6060 Fax (310) 715-1110**
**Hours Monday - Friday 8 a.m. to 4:30 p.m. PST**
**E-mail koolstar@koolstar.com**

---

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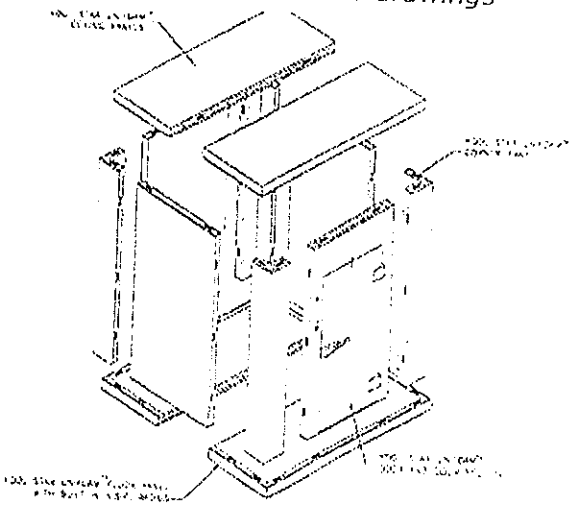
## WALK IN COOLERS

**Sales Representatives**

**Large or small, KOOL STAR provides everything you need for your cold storage requirements. Click here for cooler specifications.**

- **Beverages, Ice Cream**
- **Meats & Seafood, Fresh Produce**
- **Dairy Products, Beer & Wine**
- **Food Processing, Frozen Foods**

*Click image for more drawings*



Uniquely flexible and versatile. The insulated modular panels offer "off-the-shelf" economies with a variety of walk-in cold storage cooler and freezer configurations Available in wall thickness of 3-1/2", 4" or 5-1/2", each modular panel is insulated with foamed-in-place polyurethane insulation for the best insulating values. Cam locking assemblies allow for a fast installation forming an airtight seal.

Available in optional finishes, other options include kick plates and view windows

10a-e

the door to diamond tread plate floors and built-in interior floor ramps to full visu impact glass reach-in display doors with lights and shelving...And much more! Choose your Walk-in cold storage rooms with a fully engineered and pre-assembl refrigeration systems.

Backed by refrigeration engineering and industry professionals, KOOL STAR has assembled capable and dedicated personnel to manage all aspects of your project from design and engineering to sales and manufacturing to construction and installation. It is this team work philosophy that delivers an on-time, quality prod at the right price!

- **Partial list of KOOL STAR School Food Service Installations:**
- **Riverside Unified School District Nutritional Center**
- **Parlier Junior High School, Parlier, CA**
- **Vista Unified School District**
- **San Jacinto Unified School District**
- **Norman Brekke School, Oxnard, CA**
- **United States Military Academy Cadet Mess, West Point, NY**

See our Sales Rep List

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#11

15842/MA
Buyline 51

# mars

## COMMERCIAL TYPE AIR CURTAINS
# HEATED and UNHEATED
With PolyMars® Cabinets
C - CH - CHS MODELS

## Climate Control • Insect Control • Energy Control

Los Angeles Electrical Testing Laboratory Listed
National Electrical Code Compliance

UL LISTED · CERTIFIED · FDA COMPLIANCE · USDA COMPLIANCE · NSF CERTIFIED MODELS SEE PAGE 4

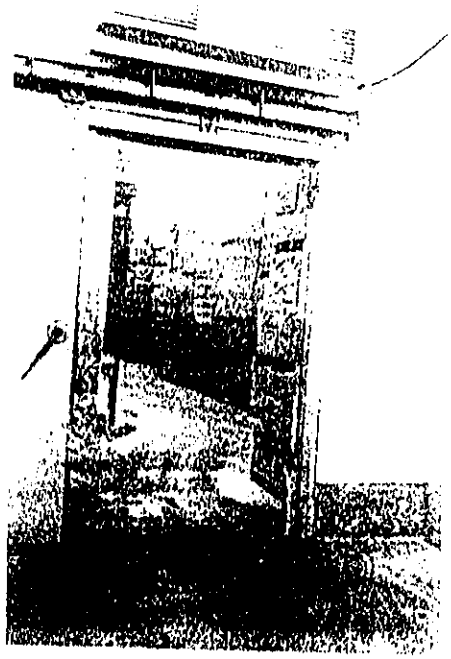
- Keep [illegible] out.
- For use over freezer and cooler doors to reduce humidity and prevent loss of cold air.
- Doors may be left open eliminating the nuisance of opening and closing automatic and manual doors.
- Reduce air conditioning [illegible]
- [illegible] customers
- [illegible] customer or [illegible]
- [illegible]

SAVE ENERGY · REDUCE HEATING AND COOLING COSTS
[illegible] to floor level [illegible]

UNHINDERED FLOW OF TRAFFIC

RECEIVING DOOR (CHS MODELS)

ENTRANCE DOOR - ELECTRIC HEATED



COLD STORAGE DOOR (CH MODELS)

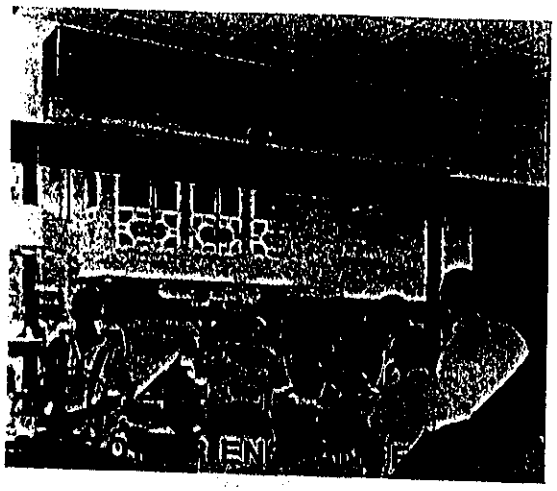
## HIGHEST QUALITY • SUPERIOR DESIGN

- [illegible]
- 5 Year Guarantee [illegible] (Unheated Models)
- Immediate Shipment
- Over 200,000 units installed
- Made in The U.S.A. for 35 Years

## DISTRIBUTOR

Bulletin No. NC-99[illegible]

# UNHEATED AIR CURTAINS



## C MODELS UNHEATED

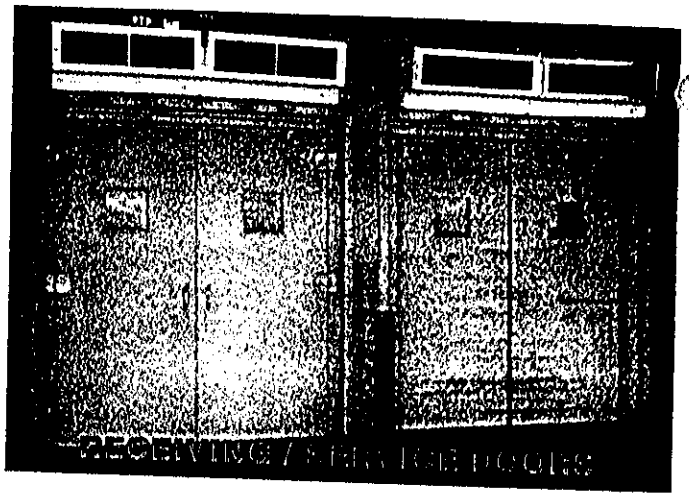
**DESIGNED TO MOUNT OVER CUSTOMER ENTRANCES**

- Create a curtain of air undetected by customers walking through doorway.
- Continually act as barrier against outside climate to maintain interior conditioned temperature.

**HOUSING DIMENSIONS:** Height 14 3/4" Depth 12 3/4"
Model Number Designates **LENGTH** of unit in inches.

| MODEL NUMBER | 1750 RPM MOTOR H.P. | AMPS Single Phase | | Max. FPM at Nozzle | Max. CFM at Nozzle | Wgt. Lbs. |
|---|---|---|---|---|---|---|
| | | 115V | 230V | | | |
| 36C | 1/2 | 5.1 | 2.5 | 2275 | 1700 | 50 |
| 38C | 1/2 | 5.1 | 2.5 | 2150 | 1700 | 52 |
| 42C | 1/2 | 5.1 | 2.5 | 1950 | 1700 | 55 |
| 48C | 1/2 | 5.1 | 2.5 | 1700 | 1700 | 60 |
| 60C | 1/2 | 5.1 | 2.5 | 2040 | 2550 | 65 |
| 60C-2 | Two 1/2 | 10.2 | 5.1 | 2720 | 3400 | 95 |
| 72C | Two 1/2 | 10.2 | 5.1 | 2275 | 3400 | 105 |
| 96C | Two 1/2 | 10.2 | 5.1 | 1700 | 3400 | 130 |

Sound Level 56 Decibels "A" Scale Measured indoors 10 ft. from nozzle, 2 motors 59 dBA.



## CH/CHS MODELS UNHEATED

**RECOMMENDED FOR ABOVE NORMAL INSECT CONDITIONS.**
Receiving and service entrance doors-markets-restaurants-hospitals-food processing plants-schools, etc.

- Inside or outside installation equally effective.
- Characteristics: Produce greater velocity of air with slightly higher sound level as compared to C models.

**HOUSING DIMENSIONS:** Height 14 3/4" Depth 12 3/4"
Units with 1 H.P. motor: Height 18" Depth 15"

| MODEL NUMBER | 1750 RPM MOTOR H.P. | AMPS Single Phase | | Max. FPM at Nozzle | Max. CFM at Nozzle | Wgt. Lbs. |
|---|---|---|---|---|---|---|
| | | 115V | 230V | | | |
| 36CH | 1/2 | 5.1 | 2.5 | 3400 | 2550 | 50 |
| 38CH | 1/2 | 5.1 | 2.5 | 3225 | 2550 | 52 |
| 42CH | 1/2 | 5.1 | 2.5 | 2925 | 2550 | 55 |
| 48CH | 1/2 | 5.1 | 2.5 | 2550 | 2550 | 60 |
| 60CH-2 | Two 1/2 | 10.2 | 5.1 | 4080 | 5100 | 95 |
| 72CH | Two 1/2 | 10.2 | 5.1 | 3400 | 5100 | 105 |
| 96CH | Two 1/2 | 10.2 | 5.1 | 2550 | 5100 | 130 |
| **CHS MODELS** | | | | | | |
| 42CHS | 1 | 16.0 | 8.0 | 4600 | 4000 | 80 |
| 48CHS | 1 | 16.0 | 8.0 | 4000 | 4000 | 85 |
| 60CHS | 1 | 16.0 | 8.0 | 3200 | 4000 | 90 |
| 96CHS | Two 1 hp | 32.0 | 16.0 | 4000 | 8000 | 160 |

Sound Level: "A" Scale Measure indoors 10 ft. from air outlet nozzle.
CH models with 1/2 HP motors are 63 dBA. Two motors 65 dBA.
CHS models with 1 HP motors are 69 dBA. Two motors 72 dBA.

**CUSTOMER ENTRANCE DOORS**
C Models - Unheated Air Curtains
**Purpose:** PREVENT LOSS OF AIR CONDITIONING. BARRIER TO DUST, INSECTS AND FUMES.

| Door Widths Up To | Door Heights Up To | Use Model Number |
|---|---|---|
| 3 ft. | 10 ft. | 36C |
| 3 1/2 ft. | 10 ft. | 42C |
| 4 ft. | 10 ft. | 48C |
| 5 ft. | 7 ft. | 60C |
| 5 ft. | 10 ft. | 60C-2 |
| 6 ft. | 10 ft. | 72C |
| 7 ft. | 10 ft. | Two 42C |
| 8 ft. | 10 ft. | 96C |
| 12 ft. | 10 ft. | Two 72C |
| 15 ft. | 7 ft. | Three 60C |

**RECEIVING/SERVICE DOORS**
CH AND CHS Models - Unheated Air Curtains **Purpose:** ABOVE NORMAL INSECT CONDITIONS. BARRIER TO DUST AND FUMES.

| Door Widths Up To | Door Heights Up To | Use Model Number |
|---|---|---|
| 3 ft. | 7 ft. | 36CH |
| 3 1/2 ft. | 7 ft. | 42CH |
| 3 1/2 ft. | 10 ft. | 42CHS |
| 4 ft. | 7 ft. | 48CH |
| 4 ft. | 10 ft. | 48CHS |
| 5 ft. | 10 ft. | 60CH-2 |
| 5 ft. | 8 ft. | 60CHS |
| 6 ft. | 7 ft. | 72CH |
| 7 ft. | 7 ft. | Two 42CH |
| 8 ft. | 10 ft. | 96CHS |
| 10 ft. | 8 ft. | Two 60CHS |
| 12 ft. | 10 ft. | 48CHS & 96CHS |

**PURPOSE: PREVENT LOSS OF REFRIGERATED AIR, REDUCE HUMIDITY AND ICE BUILD UP**

**FREEZERS:** For temperatures of -20° to +25° F.

| Door Widths Up To | Door Heights Up To | Use Model Number |
|---|---|---|
| 3 ft. | 8 ft. | 36CH |
| 3 1/2 ft. | 8 ft. | 42CH |
| 4 ft. | 8 ft. | 48CH |
| 5 ft. | 10 ft. | 60C-2 |
| 5 ft. | 10 ft. | 60CH-2 |
| 6 ft. | 8 ft. | 72CH |
| 7 ft. | 8 ft. | Two 42CH |
| 8 ft. | 8 ft. | 96CH |
| 10 ft. | 10 ft. | Two 60C-2 |
| 10 ft. | 10 ft. | Two 60CH-2 |

**COOLERS:** For temperatures of +25° to +60° F.

| Door Widths Up To | Door Heights Up To | Use Model Number |
|---|---|---|
| 3 ft. | 8 ft. | 36C |
| 3 1/2 ft. | 8 ft. | 42C |
| 4 ft. | 8 ft. | 48C |
| 5 ft. | 10 ft. | 60C-2 |
| 5 ft. | 10 ft. | 60CH-2 |
| 6 ft. | 8 ft. | 72C |
| 7 ft. | 8 ft. | Two 42C |
| 8 ft. | 8 ft. | 96C |
| 10 ft. | 10 ft. | Two 60C-2 |
| 10 ft. | 10 ft. | Two 60CH-2 |

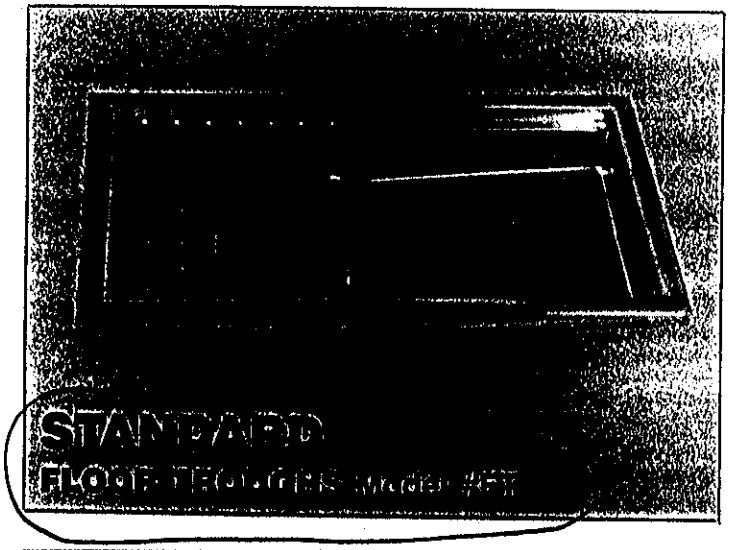
**OPTIONAL:** Micro Switch for automatic on/off operation. When door is opened, air curtain will start automatically and stop when closed. Three phase motors require magnetic controls when installing micro switch. All models have one second motor start to full capacity operation.

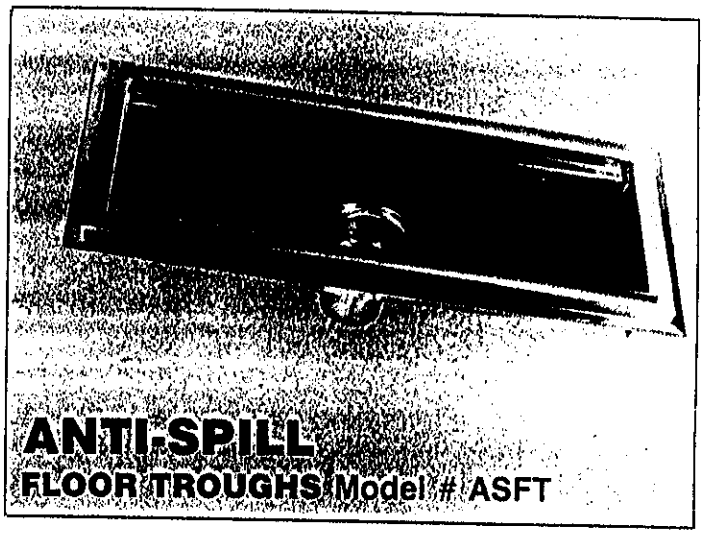
**HOUSING COLORS: WHITE** is standard production color. **GOLD, GRAY, BEIGE, DARK BRONZE** and any other decorator colors available upon request at a nominal charge.

TWO SPEED 1/2 H.P. MOTOR 115V OR 230V 1 PHASE AVAILABLE UPON REQUEST.
For unusual or problem door opening consult factory representative for suggestions regarding

ITEM #12

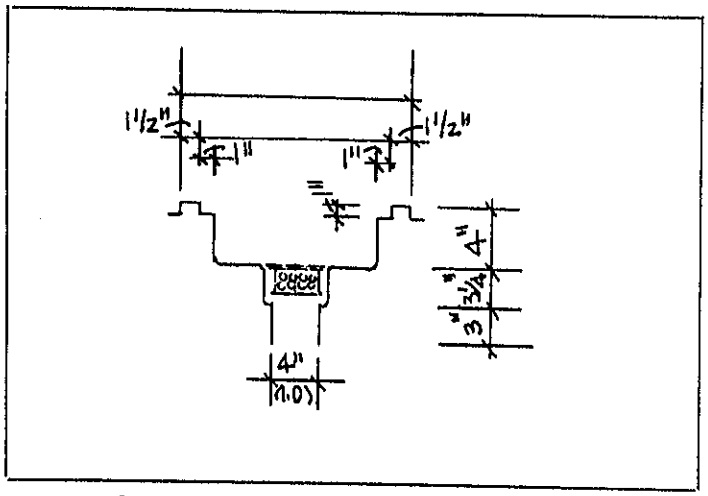
# STANDARD DEPTH FLOOR TROUGHS

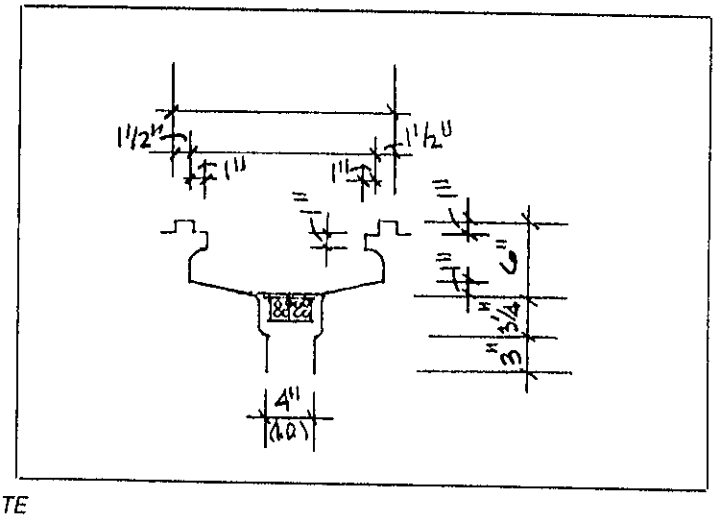



## CONSTRUCTION

All floor troughs are constructed of heavy duty 14 gauge stainless steel type 304- 18-8, completely welded and coved. All welds are ground & polished smooth. Troughs have built-in pitch towards wastes for complete drainage and anchor straps for securing. All troughs are fitted with special stainless steel waste cup with removable perforated stainless steel basket to accommodate up to 3″ waste pipe. Advise size and location of waste outlet.




*NOTE*

*For troughs less than 15″ wide 1½″ top edge will become ¾″.*


FOOD SERVICE CORP.

1-800-221-5644

POST OFFICE BOX 206 • COPIAGUE, NEW YORK 11726 • 516-789-8881

•OFFICE AND SHOWROOM, 310 MARCONI BLVD • FAX: 516-789-3633

# GRATING FOR STANDARD TROUGHS

## SUBWAY GRATING/Model #SG

(All Type 304 Stainless Steel)

Grating to be constructed of 3/16″ x 1″ bars, set in a vertical position with open front and back for ease of draining.

Two (2) 1/2″ rods, set 3″ in from each edge, are wedged thru the bars full length. Three (3) 1/2″ rods are used for grating over 15″ wide.

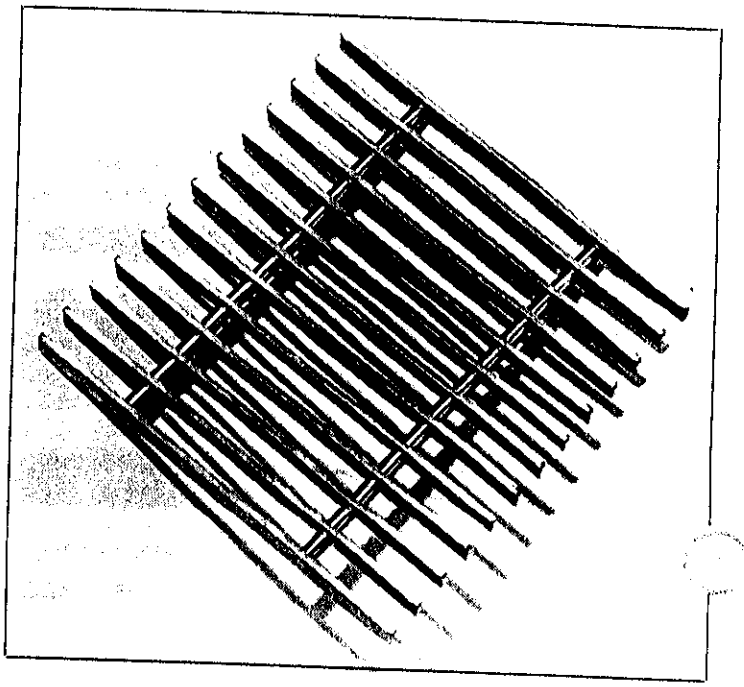
Rods are Heli Arc welded to each 3/16″ bar for rigidity thereby eliminating swaying and crevices.

There is 13/16″ clearance between bars so that wheels of mobile equipment will not become wedged.

Length of gratings are kept at maximum of 20″, for ease of handling and for cleaning in dishwasher.

(Longer lengths available upon request.)

(Bars can be had at any desired centers, specify)



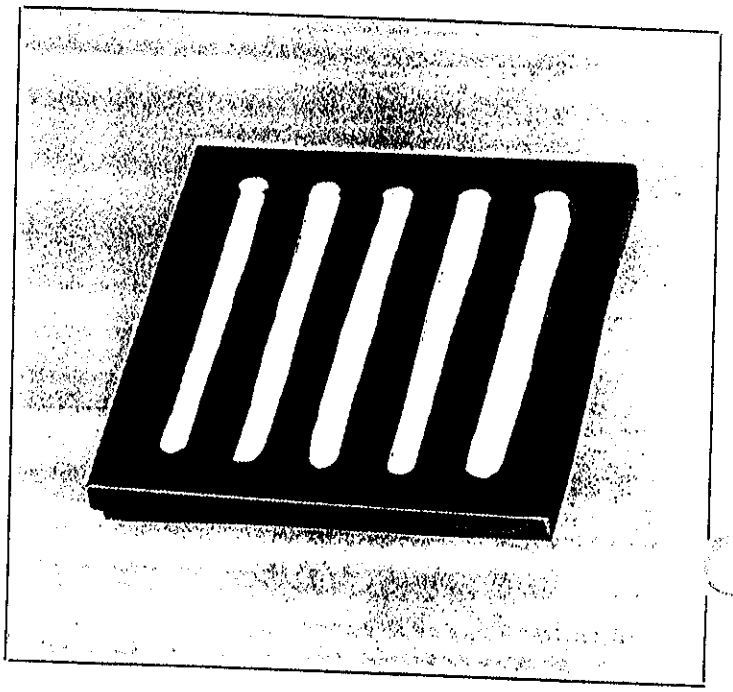
## LOUVERED GRATING /Model #FG

Grating to be fabricated of 14 gauge 18-8 type 304 stainless steel.

Gratings are 1″ thick and have die formed louvers, one piece design with a #3 polished finish.

They are fabricated in approximately 20″ lengths and are easily removed for cleaning in dishwasher.

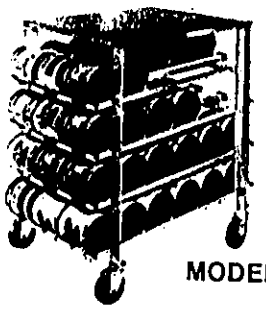
(Longer lengths available upon request.)



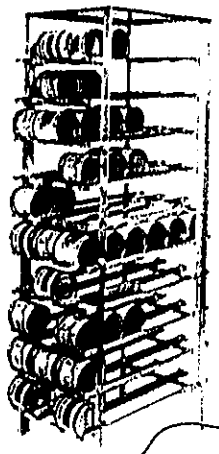
PROJECT: QUANTITY ITEM NO 12a

# CAN STORAGE RACKS

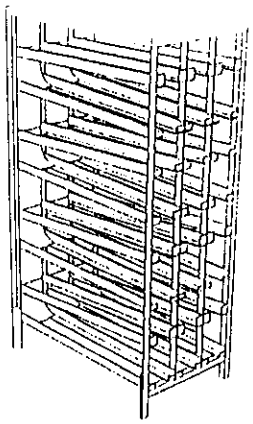
ERIES CSR



MODEL CSR-84-M



MODEL CSR-210



MODEL CSR-FF-156
Front Loading

## SPECIFICATIONS

Series CSR aluminum can storage racks.

**RAME:** The vertical corner uprights and the top and bottom cross bracing are constructed of all-welded 2" x 2" x ⅛" thick truded aluminum angles. The front and rear center uprights are 2" wide x ¼" thick aluminum, welded to the top and bottom cross ces. A solid top of either aluminum or stainless steel is securely fastened to all uprights.

**GUIDES:** The guides are 2" x 2" x ⅛" thick, formed aluminum angles with front and rear edges turned up ¾". The guides are welded to the uprights on 7¼" centers to accommodate No. 10 cans, with the rear of the guide 1½" higher than the front to allow the cans to roll forward.

**MODEL CSR-84:** The unit is mobile, mounted on four 5" diameter, heavy-duty, double ball bearing swivel casters with non-marking rubber tires. The top is 16 ga. stainless steel with all edges turned down 2". This unit is loaded from the rear.

**MODEL CSR-210:** The unit is stationary, mounted on four adjustable flanged feet welded to the uprights. The top is .060" thick aluminum with all edges turned down 2". This unit is loaded from the rear.

**MODEL CSR-308:** The unit is the same as Model CSR-210, except that it is constructed to accommodate No. 5 cans. The guides are set on 5-3/16" centers in lieu of 7¼". This unit is loaded from the rear.

**MODEL CSR-FF-156:** The unit is the same as Model CSR-210 except that it is front loading. The loading guides are inclined to the rear, where an aluminum deflector transfers the cans to unloading guides below which are inclined towards the front. Used where installation prevents rear loading.

| MODEL NO. | DIMENSIONS W | D | H | CAPACITY | SHIPPING WEIGHT |
|---|---|---|---|---|---|
| ☐ ~~CSR-84~~ | 26⅜" | 42½" | 40¾" | 84 #10 cans | 85 |
| ☒ CSR-210 | 26⅜" | 42½" | 86½" | 210 #10 cans | 168 |
| ☐ ~~CSR-308~~ | 26⅜" | 42½" | 72¾" | 308 #5 cans | 190 |
| ☐ ~~CSR-FF-156~~ | 27¼" | 42" | 81 1/16" | 156 #10 cans | 160 |

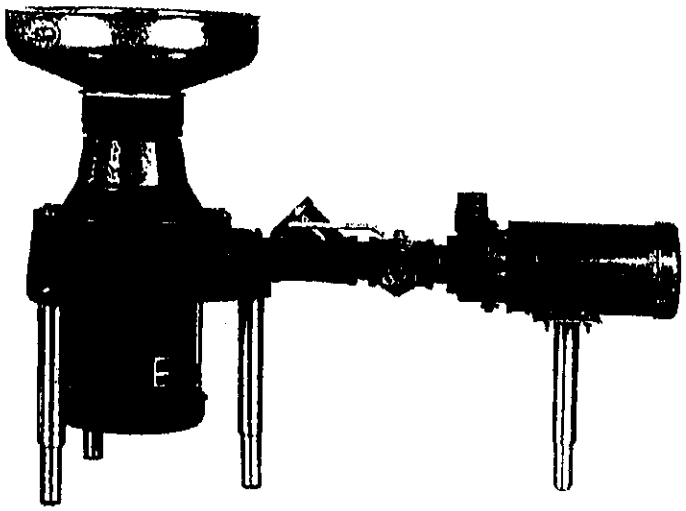
NOTE: Other sizes available, contact factory.

provide casters

SERVOLIFT EASTERN CORPORATION
266 HANCOCK STREET, BOSTON, MASSACHUSETTS 02125
(617) 825-9000 • FAX: (617) 825-1292

# somat®

## Remote Waste Pulping System



## Description

Standard SOMAT™ Model D-5 table mounted disposer, 18" stainless steel diameter bowl with disposer saver, 3 or 5 HP slurry pump, valve package, Som-A-Trol™ control panel, push button station.

## Benefits

- Up to 80% volume reduction
- Reduced labor cost
- Better sanitation
- Water conservation
- Improved operator morale

**Operation:** Foodservice waste enters the disposer via the bowl where it mixes with water, is processed and made into a slurry. The slurry, consisting of 5% solids and 95% water, is automatically transported through a pipeline to the Hydra-Extractor, where water is removed and the resultant semi-dry pulp is discharged into a haul-away container. The extracted water is recovered and returned to the disposer/slurry pump for re-use.

Somat equipment provides an economic and efficient answer to cutting the high and ever increasing costs associated with waste handling. Manufactured by Somat Corporation of Coatesville, Pennsylvania, originators of waste pulping systems and specialists in waste reduction technology.

**Approval:**

Item No. #15

SOMAT Model: **D-5 Disposer**

## Technical Specifications

**Disposer:** 5 HP disposer. 10" diameter cast stainless steel impeller. 3 jam resistant hardened stainless steel swivel cutting blocks with Tungsten carbide inserts. Stainless steel undercutter blade. 6 Ripper/Shredder bars and hard face beaded edge for prolonged life. Cast iron grind chamber with directional feeder ridges. Cast iron exit chamber with water injection inlet. Fan cooled motor with ball bearing construction. Hard, tough cast alloy grind ring with dual stage grinding action. Lifetime particle size control by non-wearing exit slots. Dynamically balanced for smooth long wearing operation. Screw type adjustable steel legs. Hush connection for 6" throat openings.

**Valve Package:** All valves required for proper operation (fresh water, bowl flush and drain lines).

**Som-A-Trol™ (Electrical Control Panel):** UL approved. Includes all necessary electrical components prewired to a terminal strip. Push button station in a NEMA 12 carbon steel enclosure.

**Options Available:**
(see accessory sheet for description)

- ☐ 6" Sink adaptor with disposer saver.
- ☐ NEMA 4 stainless steel Som-A-Trol
- ☐ Special electrical characteristics

**Electrical Characteristics:** 208/230/460 Volt, 3 Phase, 60 Hertz

**Capacity:** 400 pounds per hour of food waste only.

**Finish:** All exterior surfaces, except where polished stainless steel, are prime coated and finished with two coats of enamel paint.

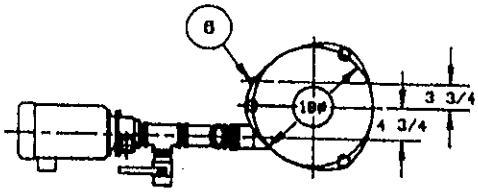
Equipment only is supplied by SOMAT Corporation. Installation, piping and wiring is not included

somat® waste reduction technology

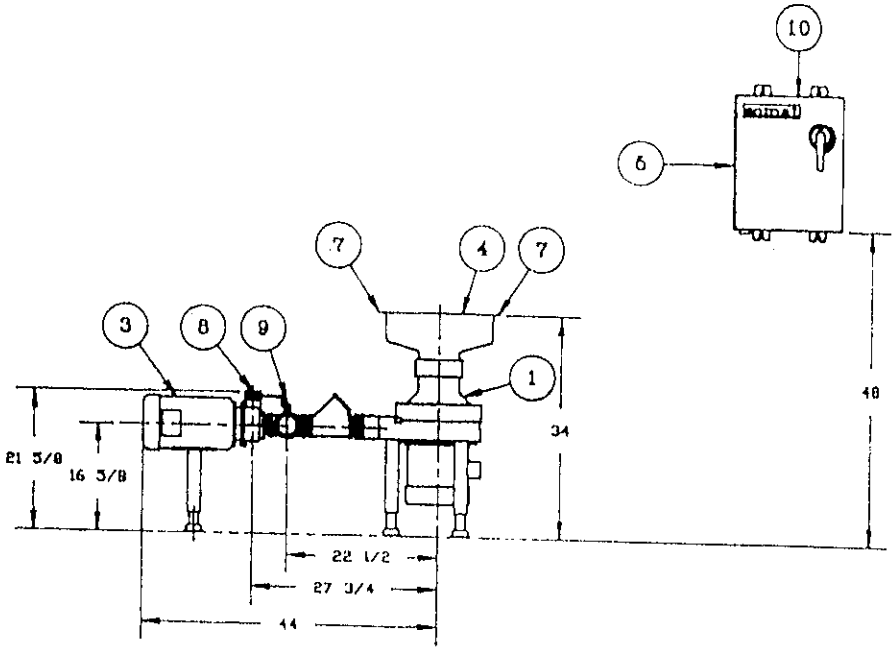
555 Fox Chase, Suite 107
Coatesville, PA 19320 USA
(610) 384-7000
Fax: (610) 380-8500
1-800-23-SOMAT
www.somatcorp.com
somatcorp@aol.com

somat®

# Remote Waste Pulping System




PLAN VIEW D-5 DISPOSER




ELEVATION VIEW D-5 DISPOSER

Utility rough-ins may vary with final configuration.
Rn and slurry piping assemblies not shown.
Unit shown with 3 hp. slurry pump.

Enlarge drawing by 129% to achieve 1/2" scale.
Reduce drawing by 64% to achieve 1/4" scale.
*A complete CAD library is now available.*

## Somat Model D-5 Disposer:

1 D-5 disposer
2 Disposer drive motor, 5 hp
3 Slurry pump, 3 hp or 5 hp
4 18" dia. bowl w/disposer saver, return water flushed
5 Som-A-Trol panel (20" h x 16" w x 8" d) with push button station

## Utility Connections:

6 Fresh water inlet, 1/2" npt
7 Rturn water inlet, 2" npt
8 Slurry pump outlet, 2" npt
9 Drain valve, 2" npt
10 Customer power supply (4 wire service required)

## Dimensions:

**Height:** 34" (865 mm)
**Length:** 53" (1350 mm)
**Width:** 22" (560 mm)

**Equipment Weight/Operating Weight:** 300 lbs./310 lbs.
**Crated Weight:** 525 lbs.
**Crated Volume:** 85 cu. ft.

## Utility Requirements:

- Fresh water, 4 gpm @ 30 psig, 1/2" npt (approximate usage 240 gph)
- Drain, 3" min. floor sink w/stainless steel removable basket.
- Power, 208V-30 amps; 230V-30 amps; 460V-20 amps, 3 phase, 60 Hz. (disconnect with circuit breaker provided in Som-A-Trol)

You'll find us in **First Place.**

TRADEMARK NOTICE: SOMAT, SOM A-PRESS, HYDRA EXTRACTOR, SOM-A-TROL, and SOM A SHEAR are registered trademarks of Somat Corporation. SOM-A-SYSTEM, SOM A MIXER, TRACK 4 SUPER SHEAR and SIDE-WINDER are other trademarks of Somat Corporation
Somat reserves the right to change specifications without notice

somat® waste reduction technology

555 Fox Chase, Suite 107
Coatesville, PA 19320 USA
(610) 384-7000
Fax: (610) 380-8500
1-800-23-SOMAT
www.somatcorp.com
somatcorp@aol.com

Randell
A DOVER COMPANY

# Series 2000 Roll-In Refrigerator

#16
ITEM # QTY.

PROJECT

DATE

## Single Section Roll-In Refrigerator- Solid Door

Model 2135

Randell Series 2000 Roll-Ins are built for years of efficient, high performance service. The top mounted, expansion valve refrigeration system offers the highest, most consistent performance available while maximizing usable interior space.

**FINISHES:**

☐ **Standard Series** **Doors/Louver:** Stainless steel.
**Exterior Sides:** Anodized aluminum. **Interior:** Anodized aluminum

☑ **E Series** Cabinet interior, exterior sides, fronts, and doors stainless steel.

ROLL THRU UNIT AVAIL.

NSF UL c UL

## Model 2135

### STANDARD FEATURES:

- Expansion Valve Thermostatic Control
- Top mounted Compressor & Evaporator Coil
- C.F.C. Free R-134a Refrigerant
- Efficient Hot Gas Condensate Evaporator
- Automatic Defrost
- 9' Cord & Plug
- Main Power Supply Switch
- Exterior Thermometer
- Self-Closing, Cam Lift Hinges with 120° Open Feature (Lifetime Warranty)
- Triple Hinged Doors
- Cylinder Door Locks
- Solid Core Stainless Steel Interior Bottom
- Polyurethane Insulation
- Snap-In Magnetic Door Gaskets
- Stainless Steel Interior Rack Guide
- Stainless Steel Removable Ramp
- Fully Coved Interior meeting N.S.F. Standard #7

### SPECIFICATIONS:

**CABINET EXTERIOR:** Cabinet body is constructed of all metal, inside & out. The top, bottom, & back are galvanized steel. Front and sides are available in finishes as listed above. Door and louver are stainless steel and are removable without tools. Provided with stainless steel removable ramp.

**CABINET INTERIOR:** Interior of cabinet is fully coved to meet N.S.F. standard #7. Solid core stainless steel interior floor is standard. The interior walls, ceiling and door liner are available in either stainless steel or anodized aluminum as listed above. Foamed in place, CFC free urethane insulation. Snap-in A.B.S. breaker strips allow access to condensate heater wires. Provided with stainless steel rack guide.

**DOORS:** Stainless steel front with either anodized aluminum or stainless steel liner, mounted on (3) heavy duty cam lift hinges with heavy duty chrome handle, and cylinder door lock.

**REFRIGERATION:** Top mounted condensing unit and evaporator coil, expansion valve system with thermostatic control, factory tested and balanced to maintain 38° F. average interior temperature utilizing CFC free 134a refrigerant. Evaporator coil is coated to resist corrosion. Unit supplied with master on/off switch and 9' cord and plug. Access to service points without tools is standard.

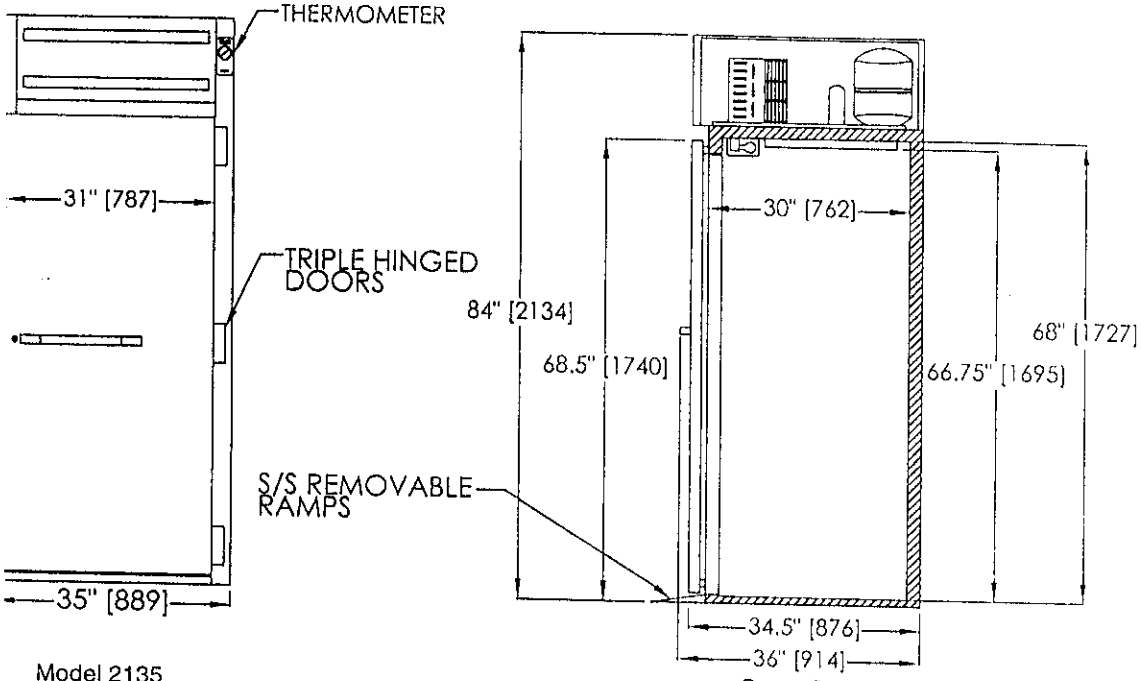
**Randell Manufacturing, Inc.**
520 S. Coldwater Rd. Weidman, MI 48893
Phone 1-800-621-8560 Fax 1-800-634-5369 www.randell.com

For the most current specifications, visit our WebSite. **www.randell.com**

Printed/Revised: *March, 2002*

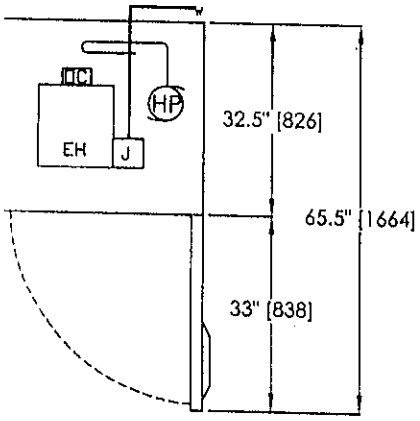
# Dimensional Data

Series 2000




Model 2135

Cross Section




LEGEND FOR 2135

- HP COMPRESSOR
- J JUNCTION BOX
- EH EVAPORATOR HOUSING
- OC CONDENSATE DRAIN 1/2"
- HOT GAS CONDENSATE EVAPORATOR

NOTE:
Unit designed to accomodate one 66" high x 26" wide x 29" deep rack.

Actual rack clearance dimensions:
66 1/2" high x 26 1/2" wide x 29 1/2" deep.

Actual door opening dimensions:
67 1/2" high x 28 1/2" wide.

SELF-CONTAINED SINGLE SECTION ROLL-IN REFRIGERATOR

| Model No. | L | D | H | Doors | Cu./Ft. | H.P. | BTU/Hr. | Volt | Amp. | NEMA | Shipping Wt. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2135 one section | 35" | 34 1/2" | 84" | 1 | 31 | 1/3 | 2300* | 115/60/1 | 8.6 | 5-15P | 850 |

* Based on 90° ambient and +20° evaporator.

OR REMOTE MODEL
se same specifications as self-contained model except for:

| lodel No. | Rec. H.P. | Rec. BTU/Hr. | Amp. | Ship Wt. |
|---|---|---|---|---|
| 135R | 1/3 | 2300 | 5 | 800 |

## OPTIONS

☐ Factory Installed 6" Height Extension
To Accommodate 72" Rack

Our Product Line Is On
The KCL CADalog

AutoCAD™ R12-2000
AutoCAD™ Lt

## Randell Manufacturing, Inc.

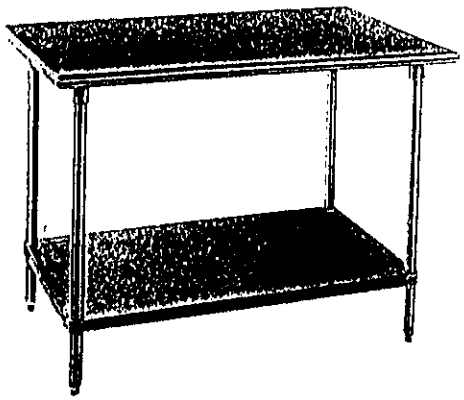
Due to a continuous program of product improvement, Randell reserves the right to make changes in design and specifications without prior notice

ADVANCE TABCO

*STAINLESS STEEL*

# WORK TABLES

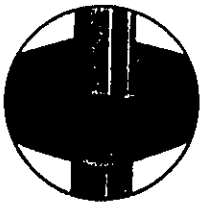
## Premium Series - Flat Top - UNDERSHELF Style



*Item #:* #17

*Model #:*

*Project #:*



*Featuring as Standard:*
**"THE PROVEN"**
ORIGINAL ADVANCE TABCO
**Adjustable Undershelf with Die Cast Leg Clamp**

### FEATURES:

Top is furnished with 1-5/8" sanitary rolled rim edges on 4 sides with rounded "bull nose" corners.

24" wide tables supplied with TWO hat channels stud welded to reinforce and maintain a level working surface. 30" and 36" wide tables supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future drawer installation.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts & bolts. Undershelf is adjustable.

### CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Stud welded hat section reinforces and maintains a level working surface.

Gussets welded to support hat sections.

### MATERIAL:

***SS-SERIES: Stainless Steel Legs & Undershelf***

**TOP:** 14 gauge stainless steel type "304" series.
**SHELF:** 18 gauge stainless steel.
**LEGS:** 1 5/8" diameter tubular stainless steel.
Stainless steel gussets.
1" adjustable metal bullet feet.

***GLG-SERIES: Galvanized Legs & Undershelf***

**TOP:** 14 gauge stainless steel type "304" series.
**SHELF:** 18 gauge galvanized steel.
**LEGS:** 1 5/8" diameter tubular galvanized steel.
Galvanized steel gussets.
1" adjustable metal bullet feet.

| Stainless Steel Legs & Undershelf | | | | | |
|---|---|---|---|---|---|
| 24" Wide | Qty. | 30" Wide | Qty. | 36" Wide | Qty. |
| SS-240 | | SS-300 | | | |
| SS-242 | | SS-302 | | | |
| SS-243 | | SS-303 | | SS-363 | |
| SS-244 | | SS-304 | | SS-364 | |
| SS-245 | | SS-305 | | SS-365 | |
| SS-246 | | SS-306 | | SS-366 | |
| SS-247 | | SS-307 | | SS-367 | |
| SS-248 | | SS-308 | | SS-368 | |
| SS-249 | | SS-309 | | SS-369 | |
| SS-2410 | | SS-3010 | | SS-3610 | |
| SS-2411 | | SS-3011 | | SS-3611 | |
| SS-2412 | | SS-3012 | | SS-3612 | |

| Galvanized Legs & Undershelf | | | | | |
|---|---|---|---|---|---|
| 24" Wide | Qty. | 30" Wide | Qty. | 36" Wide | Qty. |
| GLG-240 | | GLG-300 | | | |
| GLG-242 | | GLG-302 | | | |
| GLG-243 | | GLG-303 | | GLG-363 | |
| GLG-244 | | GLG-304 | | GLG-364 | |
| GLG-245 | | GLG-305 | | GLG-365 | |
| GLG-246 | | GLG-306 | | GLG-366 | |
| GLG-247 | | GLG-307 | | GLG-367 | |
| GLG-248 | | GLG-308 | | GLG-368 | |
| GLG-249 | | GLG-309 | | GLG-369 | |
| GLG-2410 | | GLG-3010 | | GLG-3610 | |
| GLG-2411 | | GLG-3011 | | GLG-3611 | |
| GLG-2412 | | GLG-3012 | | GLG-3612 | |

| OPTIONAL ACCESSORIES | Model # | Qty |
|---|---|---|
| Drawer | | |
| Lock | | |
| Sink | | |
| Casters | | |
| Shelving | | |
| Duplex Recept. | | |
| 16 Ga. S/S 304 Legs | | |


ADVANCE TABCO

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**TEXAS**
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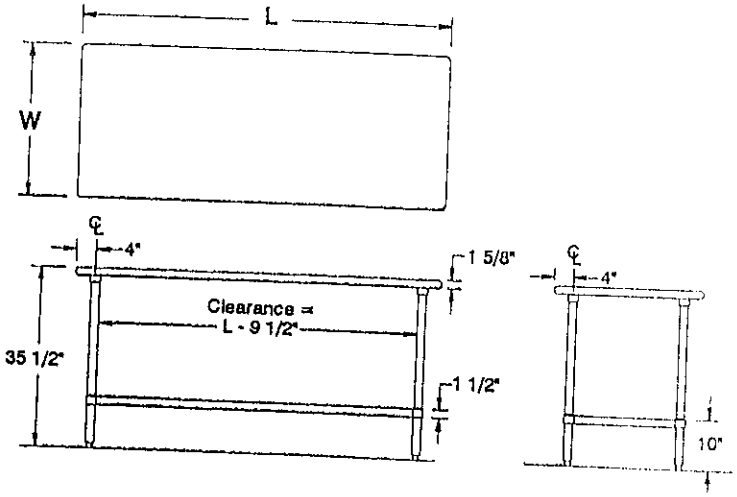
**NEVADA**
(800) 446-8684
Fax: (775) 972-1578

200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com

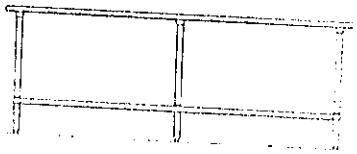
ALL DIMENSIONS ARE TYPICAL TOL ± .500"

All Units Shipped Unassembled (KD) for Reduced Shipping Costs.




SS & GLG Series
Undershelf Style
FLAT TOP

Finished size of undershelf = Length minus 5 3/4"
Width minus 5 3/4"



Units 8 ft. and larger are furnished with six (6) legs

## SS-Series: Stainless Steel Legs & Undershelf

| L | 24" Wide | Wt. | 30" Wide | Wt. | 36" Wide | Wt. |
|---|---|---|---|---|---|---|
| 30" | SS-240 | 49 lbs. | SS-300 | 65 lbs. | | |
| 24" | SS-242 | 31 lbs. | SS-302 | 55 lbs. | | |
| 36" | SS-243 | 64 lbs. | SS-303 | 72 lbs. | SS-363 | 88 lbs. |
| 48" | SS-244 | 79 lbs. | SS-304 | 89 lbs. | SS-364 | 98 lbs. |
| 60" | SS-245 | 92 lbs. | SS-305 | 107 lbs. | SS-365 | 118 lbs. |
| 72" | SS-246 | 109 lbs. | SS-306 | 125 lbs. | SS-366 | 138 lbs. |
| 84" | SS-247 | 130 lbs. | SS-307 | 148 lbs. | SS-367 | 164 lbs. |
| 96" | SS-248 | 145 lbs. | SS-308 | 166 lbs. | SS-368 | 184 lbs. |
| 108" | SS-249 | 161 lbs. | SS-309 | 176 lbs. | SS-369 | 190 lbs. |
| 120" | SS-2410 | 261 lbs. | SS-3010 | 287 lbs. | SS-3610 | 308 lbs. |
| 132" | SS-2411 | 293 lbs. | SS-3011 | 324 lbs. | SS-3611 | 358 lbs. |
| 144" | SS-2412 | 308 lbs. | SS-3012 | 339 lbs. | SS-3612 | 373 lbs. |

## GLG-Series: Galvanized Steel Legs & Undershelf

| L | 24" Wide | Wt. | 30" Wide | Wt. | 36" Wide | Wt. |
|---|---|---|---|---|---|---|
| 30" | GLG-240 | 49 lbs. | GLG-300 | 65 lbs. | | |
| 24" | GLG-242 | 31 lbs. | GLG-302 | 55 lbs. | | |
| 36" | GLG-243 | 64 lbs. | GLG-303 | 72 lbs. | GLG-363 | 88 lbs. |
| 48" | GLG-244 | 79 lbs. | GLG-304 | 89 lbs. | GLG-364 | 98 lbs. |
| 60" | GLG-245 | 92 lbs. | GLG-305 | 107 lbs. | GLG-365 | 118 lbs. |
| 72" | GLG-246 | 109 lbs. | GLG-306 | 125 lbs. | GLG-366 | 138 lbs. |
| 84" | GLG-247 | 130 lbs. | GLG-307 | 148 lbs. | GLG-367 | 164 lbs. |
| 96" | GLG-248 | 145 lbs. | GLG-308 | 166 lbs. | GLG-368 | 184 lbs. |
| 108" | GLG-249 | 161 lbs. | GLG-309 | 176 lbs. | GLG-369 | 190 lbs. |
| 120" | GLG-2410 | 261 lbs. | GLG-3010 | 287 lbs. | GLG-3610 | 308 lbs. |
| 132" | GLG-2411 | 293 lbs. | GLG-3011 | 324 lbs. | GLG-3611 | 358 lbs. |
| 144" | GLG-2412 | 308 lbs. | GLG-3012 | 339 lbs. | GLG-3612 | 373 lbs. |

ADVANCE TABCO
200 Heartland Boulevard, Edgewood, NY 11717-8380

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

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ADVANCE TABCO

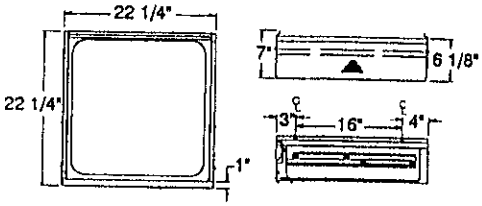
# WORK TABLE ACCESSORIES

*Item #:* #17

*Model #:*

*Project#:*

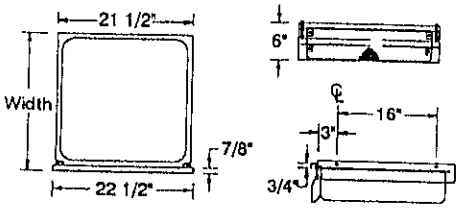
## DRAWERS - NSF SERIES




| MODEL # | Width | | Inset |
|---|---|---|---|
| NS-2015 | 22 1/4" | Stainless Steel | 20" x 15" x 5" |
| NS-2020 | 22 1/4" | Stainless Steel | 20" x 20" x 5" |

Stainless Steel Front
Ball Bearing Slides
Fully Removable Inset and Slides
Drawer Enclosure

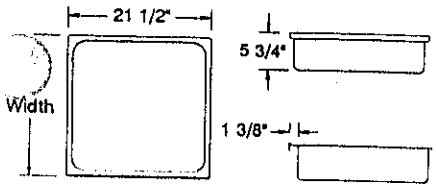
## DRAWERS - DELUXE SERIES




| MODEL # | Width | | Inset |
|---|---|---|---|
| SS-2015 | 17 3/4" | Stainless Steel | 20" x 15" x 5" |
| GZ-2015 | 17 3/4" | Galvanized | 20" x 15" x 5" |
| SS-2020 | 22 3/4" | Stainless Steel | 20" x 20" x 5" |
| GZ-2020 | 22 3/4" | Galvanized | 20" x 20" x 5" |

Stainless Steel Front
Ball Bearing Slides
Removable Inset

## DRAWERS - BUDGET SERIES




| MODEL # | Width | | Inset |
|---|---|---|---|
| FS-2015 | 17 3/4" | Stainless Steel | 20" x 15" x 5" |
| FG-2015 | 17 3/4" | Galvanized | 20" x 15" x 5" |
| FS-2020 | 22 3/4" | Stainless Steel | 20" x 20" x 5" |
| FG-2020 | 22 3/4" | Galvanized | 20" x 20" x 5" |

Friction Slides
Die Formed Handle

DRAWERS

| Model # | Qty |
|---|---|
| SS-2015 | |
| GZ-2015 | |
| SS-2020 | |
| GZ-2020 | |
| FS-2015 | |
| FG-2015 | |
| FS-2020 | |
| FG-2020 | |
| TA-14 | |
| TA-50 | |
| TA-90 | |
| TA-97 | |

ACCESSORIES

| Model # | Qty |
|---|---|
| TA-11K | |
| TA-15 | |
| TA-16 | |
| TA-18 | |
| TA-19 | |
| TA-20 | |
| TA-21 | |
| TA-23 | |
| TA-25 | |
| TA-25A | |
| TA-25B | |
| TA-25C | |
| TA-26 | |
| TA-28 | |
| TA-41 | |
| TA-42 | |
| TA-46 | |
| TA-47 | |
| TA-49 | |
| TA-68 | |
| TA-82 | |
| TA-83 | |
| TA-85 | |
| TA-86 | |
| TA-93 | |
| TA-94 | |
| TA-95 | |
| TA-99 | |

**TA-14** Drawer lock (does not apply to budget drawers)
**TA-50** Drawers modified to 15" x 20"
**TA-72** Drawer Enclosure (Upgrade to NSF Drawer)
**TA-90** Drawer Adapter (non catalog tables)
**TA-97** Poly Board storage brackets (under drawer) (must be ordered with TA-72 or NSF Drawer)

**TA-11K** Drop-In Glass Filler Station (factory installed only)
**TA-15** Metal Bullet Foot
**TA-16** Galvanized Legs with Metal Bullet Feet
**TA-18** Adjustable Flanged Metal Foot
**TA-19** Adjustable Flanged Stainless Steel Foot
**TA-20** Stainless Steel Legs with Bullet Feet
**TA-21** Stainless Steel Bullet Foot
~~**TA-23** Welded Set-up Table/Crated.~~
**TA-25** Swivel Casters (set of 4)
**TA-25A** Swivel Casters (set of 6)
**TA-25B** Brakes on all Casters.
**TA-25C** X.H.D. Urethane Wheels
**·26** Lever Operated Drain
Mapletex Cutting Board (per square foot)

**TA-41** Poly-Vance 3/4" Cutting Board (per square foot)
**TA-42** Lever Drain with Overflow.
**TA-46** Door Locks
**TA-47** Shelf Mounting Bracket on existing table
**TA-49** Lever Drain Support Brackets
**TA-68** Bin Stops
**TA-82** Scrap Chute (6" dia. opening)
**TA-83** Spice Bins
**TA-85** Plated Pot Hooks
**TA-86** Stainless Steel Pot Hooks
**TA-93** Wall Clips (on 5" & 10 1/2" splash only)
**TA-94** 16 ga. S/S 304 Series Upgrade for any shelf
**TA-95** 16 ga. S/S 304 Leg Series Upgrade
**TA-99** 16 ga. S/S 304 Upgrade for Wall and Over Shelves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e-mail: advancetabco@advancetabco.com

METRO

Item# # 20

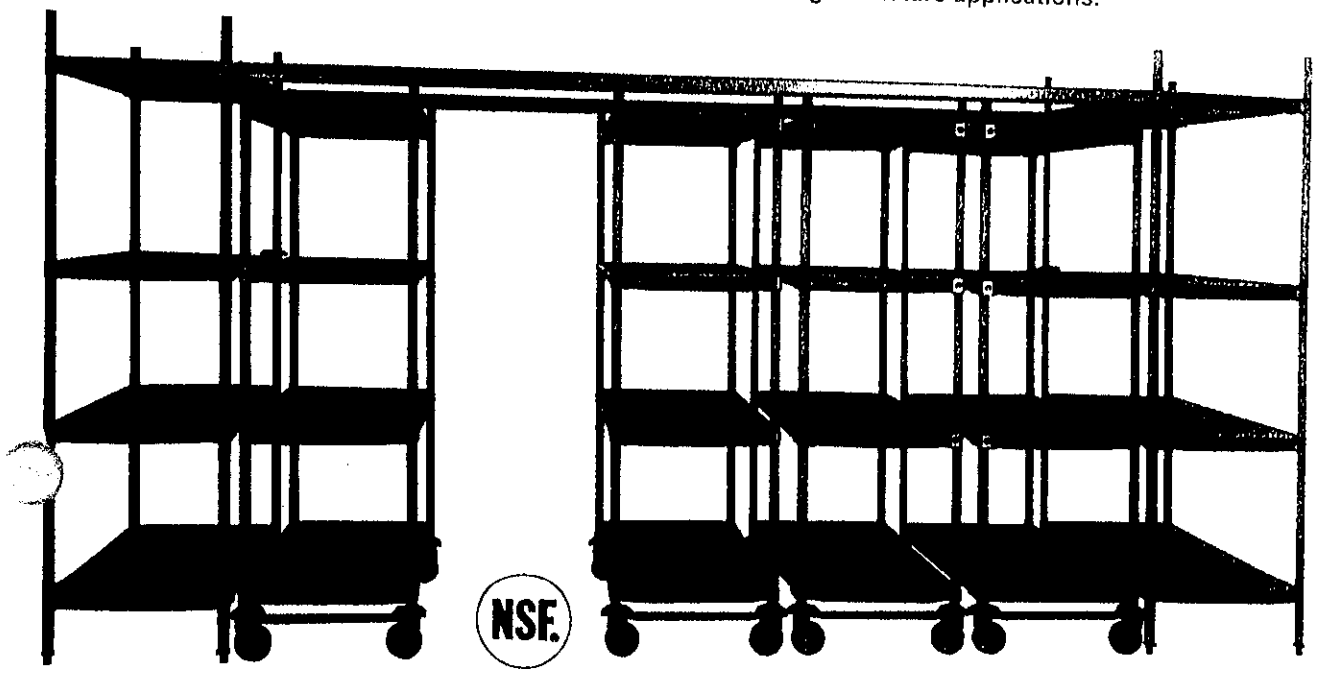
Job



- *Reduce Inventory costs*
- *Increase Revenues*
- *Insure Storage Capacity*
- *Increase Productivity*
- *Simplify Operations*

# COST-EFFECTIVE HIGH DENSITY STORAGE

**MetroMax® Top-Track™, with its open architecture and compliment of accessories, is the most versatile and cost-effective high-density storage system available. Rust proof and easy-to-clean, MetroMax Storage System components are perfect for high moisture applications.**




- **Maximizes Storage Capacity:** MetroMax Top-Track can increase the storage capacity of a given area by 30% to 40%. Mobile units are used between stationary units. Only one aisle, which can be opened between any two units as needed, is required. The MetroMax Top-Track Storage area incorporates far less aisle space and maximizes the usable storage area.
- **Cost Saving Performance:** This efficient utilization of space addresses the storage needs of new or growing operations. In a new facility, less square footage would have to be dedicated to storage. In growing operations, MetroMax Top-Track can eliminate the need to expand the facility to handle increasing storage requirements, greatly reducing the costs associated with a growing business's needs.
- **Improved Organization and Inventory Control:** MetroMax Top-Track allows better organization of stored goods and permits improved inventory control with one-stop delivery and pick-up.
- **Increased Productivity:** With reduced square footage dedicated to storage, MetroMax Top-Track maximizes the amount of productive "front of the house" space available, increasing daily revenues.
- **Safe/Accessible:** The overhead track system provides an unobstructed walking area within the system, eliminating potential safety hazards often caused by floor-mounted tracks. This also provides easy aisle access for utility carts, simplifying material handling tasks.
- **MetroMax System:** At the core of MetroMax Top-Track is the MetroMax Storage System, by far the most revolutionary and advanced system of its kind in the marketplace today. Incredibly strong, with materials that are backed by a lifetime warranty against rust, MetroMax lets you add a storage level at any time. Interchangeable solid and open grid mats, and a wide array of accessories, give it unequaled versatility.

METRO
InterMetro Industries Corporation
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

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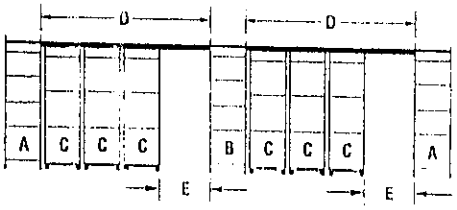
Job_____

# METRO MAX® TOP-TRACK™ HIGH-DENSITY STORAGE SYSTEM

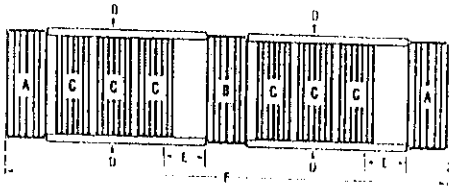
## SYSTEM COMPONENTS

A = Stationary End Units
B = Stationary Intermediate Unit (Optional)
C = Mobile Units
D = Track Set
E = Open Aisle
F = Overall System Length

### FRONT VIEW




### OVERHEAD VIEW




### STATIONARY UNIT KIT

Cat. No. TTSUX

Kit includes the hardware necessary for connecting track sets to two stationary end units or one intermediate unit. Kit components are stainless steel. Posts and shelves are sold separately. The stationary units require the use of 86" (2185mm) posts (86PX). A stationary intermediate unit is required when track length exceeds 21' (6405mm). A stationary intermediate unit may be used at the discretion of the user when track lengths are less than 21'. The stationary end and intermediate units must have a minimum of 4 shelves. The width of the stationary end and intermediate unit should be equal to or greater than the width of the mobile units.

### MOBILE UNIT KIT

One kit is required per mobile unit. Kit includes casters, caster channels, bumpers, and roller assemblies. Posts and shelves sold separately. If 18" (455mm) wide mobile units are planned, the maximum allowable size shelf is 60" (1525mm) long. If 18" wide by 60" long mobile units are planned, a maximum of 5-18" mobile units are allowable between two stationary units. 18" and 24" wide mobile units can be intermixed in a given system. The standard system requires 74" (1880mm) posts (74PX) on the mobile units. Recommended maximum load rating for a mobile unit is 900 lbs. (400kg). Floor should be level, smooth, and free from large cracks and raised obstacles.

| Shelf Width (in.) | (mm) | Cat. No. Chrome | Cat. No. Stainless Steel |
|---|---|---|---|
| 18 | 455 | TTM18ACX | TTM18ASX |
| 24 | 610 | TTM24ACX | TTM24ASX |

### TRACK SETS

Includes necessary sections of track for assembling track runs of 6' to 21' (1830mm-6405mm). Track sets are available in even 1' (305mm) increments. **Only one track set is required between stationary units.**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6' (1830mm) TTS6NX | 7' (2135mm) TTS7NX | 8' (2440mm) TTS8NX | 9' (2745mm) TTS9NX | 10' (3050mm) TTS10NX | 11' (3355mm) TTS11NX | 12' (3660mm) TTS12NX | 13' (3965mm) TTS13NX |
| 14' (4270mm) TTS14NX | 15' (4575mm) TTS15NX | 16' (4880mm) TTS16NX | 17' (5185mm) TTS17NX | 18' (5490mm) TTS618NX | 19' (5795mm) TT19NX | 20' (6100mm) TTS20NX | 21' (6405mm) TTS21NX |

### DIMENSIONS

**System Length:** Actual system length is equal to:

Nominal widths of end units + nominal track length + 1" (25mm). If stationary intermediate unit(s) is used, add 1" (25mm) per stationary intermediate unit.

Example: System contains 1 - 24" (610mm) wide end unit, 12' (3660mm) track length, and 1 - 18" (455mm) wide end unit. Actual system length equals 2'0" (610mm) + 12'0" (3660mm) + 1'6" (455mm) + 0'1" (25mm) = 15'7" (4750mm) actual system length.

Example: System containing 1 - 24" (610mm) wide stationary end unit, a 14' (4270mm) track length, 1 - 24" (610mm) wide stationary intermediate unit, a 12' (3660mm) track length, and 1 - 18" (455mm) stationary end unit. Actual system length is equal to 2'0" (610mm) + 14'0" (4270mm) + 2'0" (610mm) + 12'0" (3660mm) + 1'6" (455mm) + 0'1" (25mm) + 0'1" (25mm) = 31'8" (9652mm) actual system length.

**Aisle Width:** Under normal conditions, an aisle width of 30" to 36" (760mm - 914mm) is recommended. The storage of very large objects within the system, however, may require an aisle width larger than 36" (914mm). When determining aisle width, actual mobile unit widths must be considered. Actual mobile unit width is equal to the nominal mobile unit width 18" or 24" (455mm or 610mm) plus 2½" (64mm).

Example: A 12' (3660mm) track set is incorporated between stationary units. Desired aisle width is approximately 30" (760mm). 2-24" (610mm) wide and 3-18" (455mm) wide mobile units are selected. Actual width of each mobile unit is:

24" (610mm) + 2½" (64mm) = 26½" (674mm); 18" (455mm) + 2½" (64mm) = 20½" (519mm).

Overall actual track space utilized by mobile units is:
2 x (26½") + 3 x (20½") =
53" (1346mm) + 61½" (1562mm) = 114.5" (2908mm)

Overall track length equals 12' x 12" per foot = 144.0" (3658mm)
Space utilized by mobile units = 114.5" (2908mm)
Aisle space available = 29.5" (750mm) (or approximately 30" (760mm))

**Note:** If the MetroMax Top-Track System is to be installed for single side access with the rear of the unit against the wall, provide 5" (12.7cm) clearance between rear wall and system to allow for room variations and system dynamics.

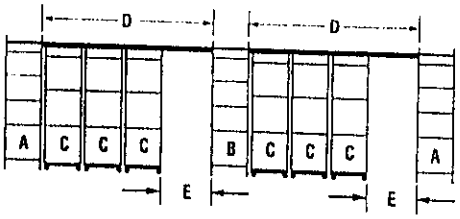

Manufactured by:
InterMetro Industries Corp.
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

Phone 717-825-2741
FAX 717-825-2852
For Product Information, call 1-800-433-2232
For Customer Service, call 1-800-992-1776

Job_____ #20

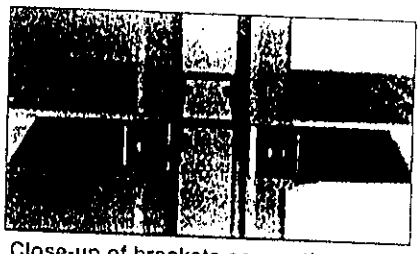
# METRO MAX® DOUBLE DEEP TOP-TRACK™ HIGH-DENSITY STORAGE SYSTEM

## FRONT VIEW



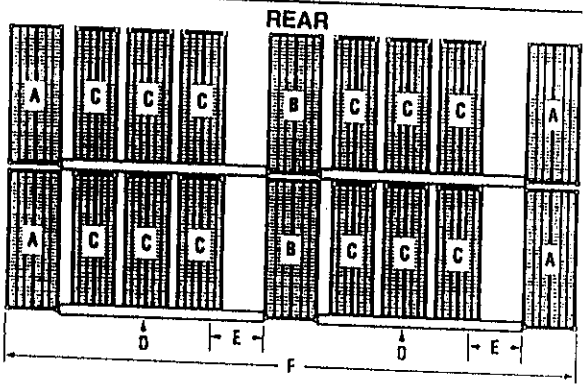

## SYSTEM COMPONENTS

A = Stationary End Units
B = Stationary Intermediate Unit (Optional)
C = Mobile Units
D = Track Set
E = Open Aisle
F = Overall System Length

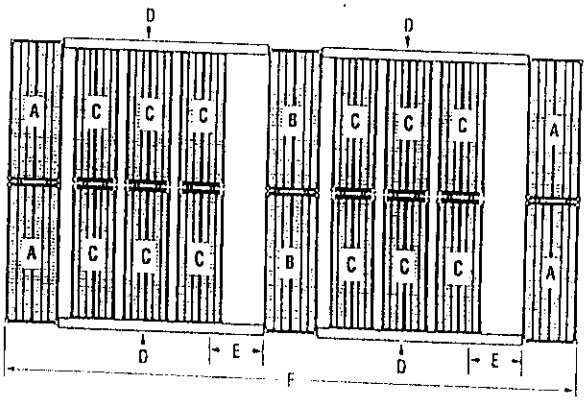


Close-up of brackets connecting units in Double Deep System end-to-end.

## SINGLE ACCESS




## DOUBLE ACCESS




### STATIONARY END UNIT KITS
Cat. No. LTTSUX

ONE KIT includes necessary components for connecting BOTH stationary end units of MetroMax Double Deep Top-Track to an overhead track set. **SHELVES AND POSTS SOLD SEPARATELY.** 86" (2185mm) posts required.

### STATIONARY INTERMEDIATE UNIT KITS*
Cat. No. LTTIUX

Includes hardware necessary for connecting intermediate stationary units in MetroMax Double Deep systems and connecting to an overhead track set on each side. **ONE KIT IS REQUIRED FOR INTERMEDIATE UNITS CONNECTED END-TO-END. SHELVES AND POSTS SOLD SEPARATELY.** 86" (2185mm) posts required.

*Required for track sets longer than 14' (4270mm).

### TRACK SETS

Includes necessary sections of track for assembling track runs of 6' to 14' (1830mm-4270mm). Track sets are available in even 1' (305mm) increments. **Only one track set is required between each pair of stationary units, including intermediate stationary units.**

| | | | | |
|---|---|---|---|---|
| 6' (1830mm) TTS6NX | 7' (2135mm) TTS7NX | 8' (2440mm) TTS8NX | 9' (2745mm) TTS9NX | 10' (3050mm) TTS10NX |
| 11' (3355mm) TTS11NX | 12' (3660mm) TTS12NX | 13' (3965mm) TTS13NX | 14' (4270mm) TTS14NX | |

### MOBILE UNIT KIT

One kit is required per mobile unit. Kit includes casters, caster channels, bumpers, and roller assemblies. Posts and shelves sold separately. If 18" (455mm) wide mobile units are planned, the maximum allowable size shelf is 48" (1220mm) long. If 18" wide by 48" long mobile units are planned, a maximum of 5-18" mobile units are allowable between two stationary units. 18" and 24" wide mobile units can be intermixed in a given system. The standard system requires 74" (1880mm) posts (74UPX) on the mobile units. Recommended maximum load rating for a mobile aisle is 1200 lbs. (544kg), or 600 lbs. (272kg) per unit. Floor should be level, smooth, and free from large cracks and raised obstacles.

| Shelf Width (in.) | (mm) | Cat. No. Chrome | Cat. No. Stainless Steel |
|---|---|---|---|
| 18 | 455 | LTTM18ACX | LTTM18ASX |
| 24 | 610 | LTTM24ACX | LTTM24ASX |


**Manufactured by:**
**InterMetro Industries Corp.**
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Wilkes-Barre, PA 18705
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FAX 717-825-2852
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For Customer Service, call 1-800-992-1776


MetroMax® Double Deep Top-Track™ High-Density Storage Systems

Job_____

# METRO MAX® TOP-TRACK™ HIGH-DENSITY STORAGE SYSTEM

## CRITICAL DIMENSIONS

- **System Length:** Actual system length is equal to:

  Nominal widths of end units + nominal track length + 1" (25mm). If stationary intermediate unit(s) is used, add 1" (25mm) per stationary intermediate unit.

  Example: System contains 1 - 24" (610mm) wide end unit, 12' (3660mm) track length, and 1 - 18" (455mm) wide end unit. Actual system length equals 2'0" (610mm) + 12'0" (3660mm) + 1'6" (455mm) + 0'1" (25mm) = 15'7" (4750mm) actual system length.

- **System Depth:** Actual system depth for a **Single Deep** Top-Track System is equal to:

  Nominal Length of end and mobile units + 2½" (64mm).

  Example: System contains 60" (1525mm) long end and mobile units. Actual system depth equals 60" (1525mm) + 2½" (64mm) = 62½" (1589mm).

  Actual system depth for a **Double Deep** MetroMax Top-Track System is equal to:

  Nominal width of both end or mobile units + 4½" (115mm).

  Example: System contains 2 - 48" (1220mm) long end and mobile units. Actual system depth = 48" + 48" + 4½" = 100½" (2753mm).

- **Aisle Width:** Under normal conditions, an aisle width of 30" to 36" (760mm - 914mm) is recommended. The storage of very large objects within the system, however, may require an aisle width larger than 36" (914mm). When determining aisle width, actual mobile unit widths must be considered. Actual mobile unit width is equal to the nominal mobile unit width 18" or 24" (455mm or 610mm) plus 2½" (64mm).

  Example: A 12' (3660mm) track set is incorporated between stationary units. Desired aisle width is approximately 30" (760mm). 2-24" (610mm) wide and 3-18" (455mm) wide mobile units are selected. Actual width of each mobile unit is:

  24" (610mm) + 2½" (64mm) = 26½" (674mm); 18" (455mm) + 2½" (64mm) = 20½" (519mm).

  Overall actual track space utilized by mobile units is
  2 x (26½") + 3 x (20½") =
  53" (1346mm) + 61½" (1562mm) = 114.5" (2908mm)

| | |
|---|---|
| Overall track length equals 12' x 12" per foot | 144.0" (3658mm) |
| Space utilized by mobile units | 114.5" (2908mm) |
| Aisle space available | 29.5" (750mm) (or approximately 30" (760mm)) |

**Note:** If the MetroMax Top-Track System is to be installed for single side access with the rear of the unit against the wall, provide 5" (12.7cm) clearance between rear wall and system to allow for room variations and system dynamics.

## ACCESSORIES

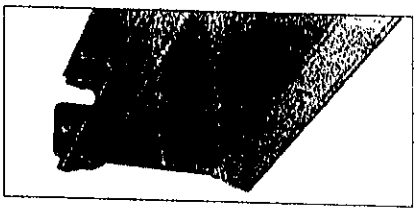
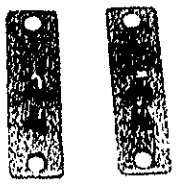


**Illustration of both the Top-Track Wall Mount Bracket Kit and Stop Kit**

### MetroMax® Top-Track™ Wall Mount Bracket Kit

For use when mobile end unit is required for wall access, or, if access to rear of end unit is necessary.

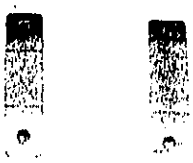
**NOTE:** Hardware for mounting bracket is not included due to wall construction variations.



Cat. No. TTWMX
(includes one pair of brackets for mounting one end of Top-Track System to wall)

### MetroMax® Top-Track™ Stop Kit

May be used in conjunction with the Wall Mount Bracket Kit to prohibit mobile end units from striking the mounting wall.



Cat. No. TTSTPX
(includes one pair of stops for one end of a system)

**InterMetro Industries Corporation**
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

L02-004H
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Printed in U.S.A.

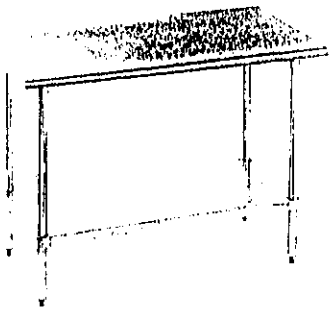
Information and specifications are subject to change without notice. Please confirm at time of order.

ADVANCE TABCO

STAINLESS STEEL

# WORK TABLES

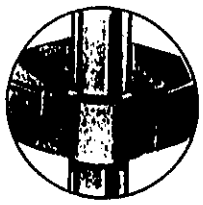
## PREMIUM Series - 1 1/2" Splash - UNDERSHELF Style



*Item #:* #21

*Model #:*

*Project #:*



*Featuring as Standard:*
**"THE PROVEN"**
ORIGINAL ADVANCE TABCO
**Adjustable Undershelf with Die Cast Leg Clamp**

NSF

### FEATURES:

Top is furnished with a 1 5/8" sanitary rolled rim edge on front, a 1 5/8" square bend on sides, and a 1 1/2" splash of single metal thickness on the rear side.

24" wide tables supplied with TWO hat channels stud welded to reinforce and maintain a level working surface. 30" and 36" wide tables supplied with THREE hat channels.

Pre-engineered welded angle adapters insure ease of future leveler installation.

Aluminum die cast "leg-to-shelf" clamp secures shelf to leg eliminating unsightly nuts and bolts. Undershelf is adjustable

### CONSTRUCTION:

All TIG welded. Exposed weld areas polished to match adjacent surfaces.

Entire top mechanically polished to a satin finish.

Top is sound deadened.

Stud welded hat section reinforces and maintains a level working surface.

Gussets welded to support hat sections.

### MATERIAL:

***FSS-SERIES: Stainless Steel Legs & Undershelf***

**TOP:** 14 gauge stainless steel type "304" series.
**SHELF:** 18 gauge stainless steel.
**LEGS:** 1 5/8" diameter tubular stainless steel.
Stainless steel gussets.
1" adjustable metal bullet feet.

***FLG-SERIES: Galvanized Legs & Undershelf***

**TOP:** 14 gauge stainless steel type "304" series.
**SHELF:** 18 gauge galvanized steel.
**LEGS:** 1 5/8" diameter tubular galvanized steel.
Galvanized steel gussets.
1" adjustable metal bullet feet.

**Stainless Steel Legs & Undershelf**

| 24" Wide | Qty. | 30" Wide | Qty. | 36" Wide | Qty. |
|---|---|---|---|---|---|
| FSS-240 | | FSS-300 | | | |
| FSS-242 | | FSS-302 | | | |
| FSS-243 | | FSS-303 | | FSS-363 | |
| FSS-244 | | FSS-304 | | FSS-364 | |
| FSS-245 | | FSS-305 | | FSS-365 | |
| FSS-246 | | FSS-306 | * | FSS-366 | |
| FSS-247 | | FSS-307 | | FSS-367 | |
| FSS-248 | | FSS-308 | | FSS-368 | |
| FSS-249 | | FSS-309 | | FSS-369 | |
| FSS-2410 | | FSS-3010 | | FSS-3610 | |
| FSS-2411 | | FSS-3011 | | FSS-3611 | |
| FSS-2412 | | FSS-3012 | | FSS-3612 | |

**Galvanized Legs & Undershelf**

| 24" Wide | Qty. | 30" Wide | Qty. | 36" Wide | Qty. |
|---|---|---|---|---|---|
| FLG-240 | | FLG-300 | | | |
| FLG-242 | | FLG-302 | | | |
| FLG-243 | | FLG-303 | | FLG-363 | |
| FLG-244 | | FLG-304 | | FLG-364 | |
| FLG-245 | | FLG-305 | | FLG-365 | |
| FLG-246 | | FLG-306 | | FLG-366 | |
| FLG-247 | | FLG-307 | | FLG-367 | |
| FLG-248 | | FLG-308 | | FLG-368 | |
| FLG-249 | | FLG-309 | | FLG-369 | |
| FLG-2410 | | FLG-3010 | | FLG-3610 | |
| FLG-2411 | | FLG-3011 | | FLG-3611 | |
| FLG-2412 | | FLG-3012 | | FLG-3612 | |

| OPTIONAL ACCESSORIES | Model # | Qty |
|---|---|---|
| Drawer | | |
| Lock | | |
| Sink | | |
| Casters | | |
| Shelving | | |
| Duplex Recept. | | |
| 16 Ga. S/S 304 Legs | | |


ADVANCE TABCO

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**NEVADA**
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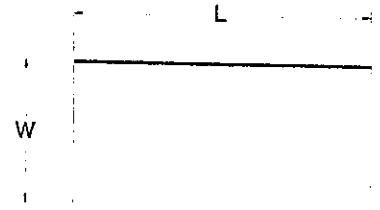
200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com

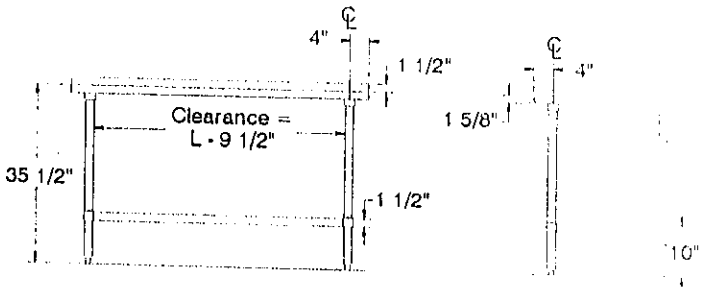
# DETAILS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL TOL ± .500"

All Units Shipped Unassembled (KD) for Reduced Shipping Costs




FSS & FLG Series
Undershelf Style
1 1/2" Backsplash




Finished size of undershelf = Length minus 5 3/4"
Width minus 5 3/4"

Units 8ft. and larger are furnished with six (6) legs

## FSS-Series: Stainless Steel Legs & Undershelf

| L | 24" Wide | Wt. | 30" Wide | Wt. | 36" Wide | Wt. |
|---|---|---|---|---|---|---|
| 30" | FSS-240 | 49 lbs. | FSS-300 | 65 lbs. | | |
| 24" | FSS-242 | 31 lbs. | FSS-302 | 55 lbs. | | |
| 36" | FSS-243 | 64 lbs. | FSS-303 | 72 lbs. | FSS-363 | 88 lbs. |
| 48" | FSS-244 | 79 lbs. | FSS-304 | 89 lbs. | FSS-364 | 98 lbs. |
| 60" | FSS-245 | 92 lbs. | FSS-305 | 107 lbs. | FSS-365 | 118 lbs. |
| 72" | FSS-246 | 109 lbs. | FSS-306 | 125 lbs. | FSS-366 | 138 lbs. |
| 84" | FSS-247 | 130 lbs. | FSS-307 | 148 lbs. | FSS-367 | 164 lbs. |
| 96" | FSS-248 | 145 lbs. | FSS-308 | 166 lbs. | FSS-368 | 184 lbs. |
| 108" | FSS-249 | 161 lbs. | FSS-309 | 176 lbs. | FSS-369 | 190 lbs. |
| 120" | FSS-2410 | 261 lbs. | FSS-3010 | 287 lbs. | FSS-3610 | 308 lbs. |
| 132" | FSS-2411 | 293 lbs. | FSS-3011 | 324 lbs. | FSS-3611 | 358 lbs. |
| 144" | FSS-2412 | 308 lbs. | FSS-3012 | 339 lbs. | FSS-3612 | 373 lbs. |

## FLG-Series: Galvanized Steel Legs & Undershelf

| L | 24" Wide | Wt. | 30" Wide | Wt. | 36" Wide | Wt. |
|---|---|---|---|---|---|---|
| 30" | FLG-240 | 49 lbs. | FLG-300 | 65 lbs. | | |
| 24" | FLG-242 | 31 lbs. | FLG-302 | 55 lbs. | | |
| 36" | FLG-243 | 64 lbs. | FLG-303 | 72 lbs. | FLG-363 | 88 lbs. |
| 48" | FLG-244 | 79 lbs. | FLG-304 | 89 lbs. | FLG-364 | 98 lbs. |
| 60" | FLG-245 | 92 lbs. | FLG-305 | 107 lbs. | FLG-365 | 118 lbs. |
| 72" | FLG-246 | 109 lbs. | FLG-306 | 125 lbs. | FLG-366 | 138 lbs. |
| 84" | FLG-247 | 130 lbs. | FLG-307 | 148 lbs. | FLG-367 | 164 lbs. |
| 96" | FLG-248 | 145 lbs. | FLG-308 | 166 lbs. | FLG-368 | 184 lbs. |
| 108" | FLG-249 | 161 lbs. | FLG-309 | 176 lbs. | FLG-369 | 190 lbs. |
| 120" | FLG-2410 | 261 lbs. | FLG-3010 | 287 lbs. | FLG-3610 | 308 lbs. |
| 132" | FLG-2411 | 293 lbs. | FLG-3011 | 324 lbs. | FLG-3611 | 358 lbs. |
| 144" | FLG-2412 | 308 lbs. | FLG-3012 | 339 lbs. | FLG-3612 | 373 lbs. |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ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

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# TABLE MODIFICATIONS

(ITEM #21)

*Item #:* Part of #26

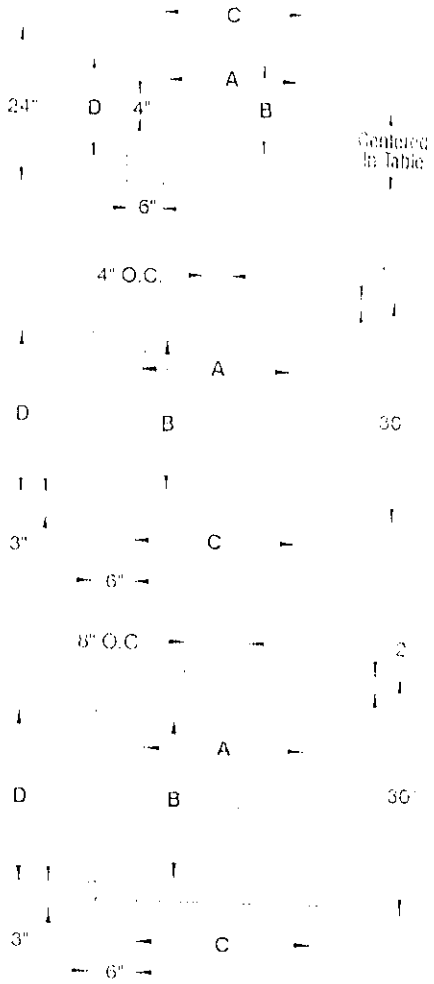
*Model #:*

*Project#:*

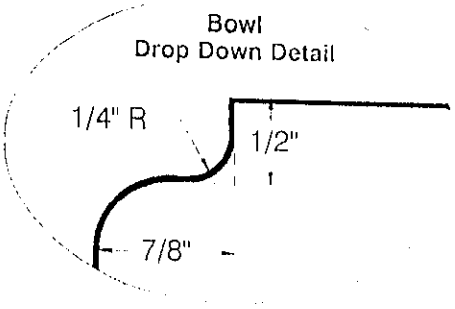
## Multiple Sink Sizes
### (welded into Table Top)

| | A | B | Bowl Depth | C | D | Qty |
|---|---|---|---|---|---|---|
| TA-11A | 16" x 20" x 8" | | | 17 3/4" | 21 3/4" | ____ |
| TA-11B | 16" x 20" x 12" | | | 17 3/4" | 21 3/4" | ____ |
| * TA-11C | 20" x 20" x 8" | | | 21 3/4" | 21 3/4" | ____ |
| * TA-11D | 20" x 20" x 12" | | | 21 3/4" | 21 3/4" | ____ |
| ** TA-11E | 24" x 24" x 12" | | | 25 3/4" | 25 3/4" | ____ |
| TA-11F | 10" x 14" x 10" | | | 11 3/4" | 15 3/4" | ____ |
| * TA-11G | 20" x 28" x 12" | | | 21 3/4" | 29 3/4" | ____ |
| TA-11H | 12" x 20" x 12" | | | 13 3/4" | 21 3/4" | ____ |
| TA-11J | 14" x 16" x 12" | | | 15 3/4" | 17 3/4" | ____ |

*Only installed in tables 30" or wider.
**Only installed in tables 36" or wider.




Bowl
Drop Down Detail




COUNTERTOP TABLES with splash are furnished with a 12" Splash Mounted Faucet as standard.

**TA-17** Upgrade extra heavy duty 12" splash mounted faucet.

**TA-11Z** Optional: 5" Splash Tables require a 2" return for splash mounted faucet.

**Standard Fittings:**

**K-52** Deck Mounted Gooseneck Faucet
**K-6** 1 1/2" IPS S/S Basket Type Drain
**TA-51** Upgrade Deck Mounted Gooseneck
**TA-53** Replacement X.H.D. Deck Mounted Gooseneck

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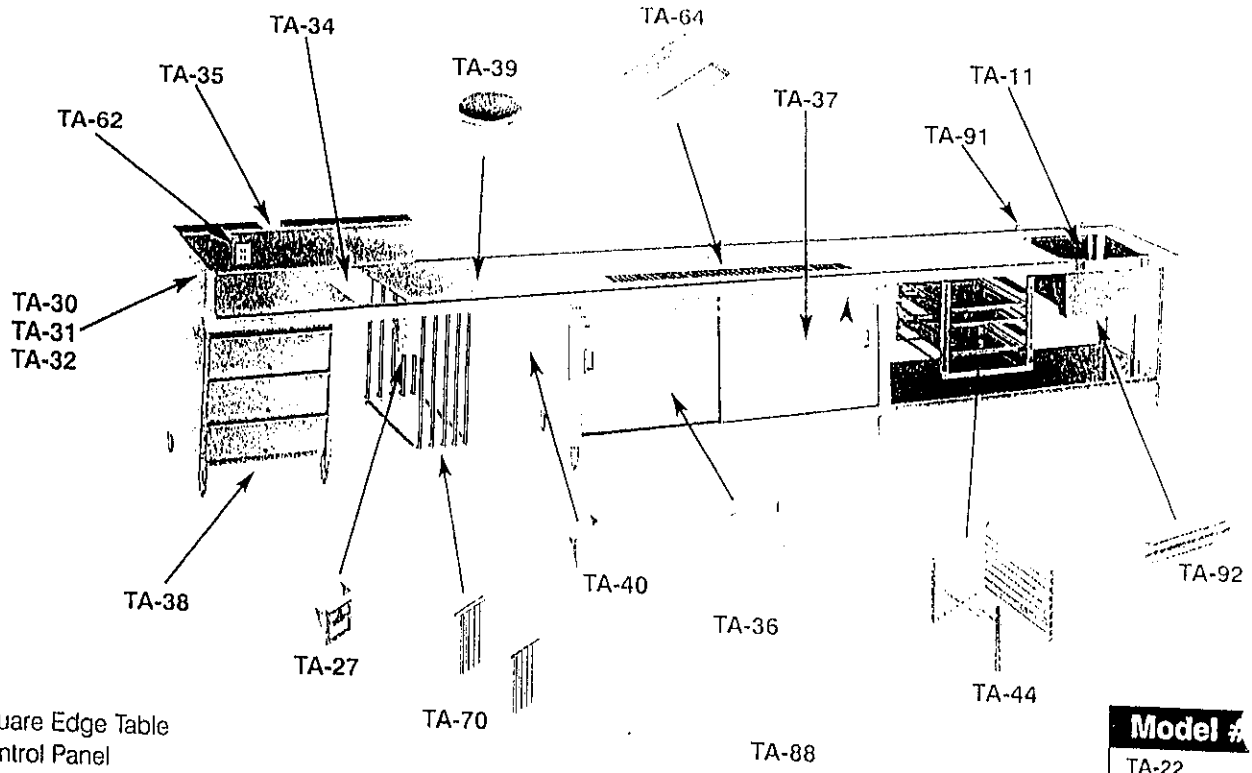
# TABLE MODIFICATIONS

*Item #:*

*Model #:*

*Project#:*




| | |
|---|---|
| TA-22 | Square Edge Table |
| TA-27 | Control Panel |
| TA-30 | 1 1/2" Side Splash |
| TA-31 | 5" Side Splash |
| TA-32 | 10 1/2" Side Splash |
| TA-33 | Special Working Height |
| TA-34 | Top Cut-out |
| TA-35 | Splash Cut-out |
| TA-36 | Sliding Stainless Steel Door |
| TA-37 | Stainless Steel Enclosed Base |
| TA-38 | S/S (3) Tier Drawers (20" x 20" x 5" drawer inserts) |
| TA-39 | Installation (only) of disposal cone or collar |
| TA-40 | Control Bracket |
| TA-44 | Aluminum Pan Rack Slides (table min. length 3") |
| TA-45 | Aluminum Glass Rack Slides (table min. length 3") |
| TA-60 | Special Sizing Charge for Wall Shelves |
| TA-61 | Special Modification Charge |
| TA-62 | Duplex Electrical Outlet (flat top) |
| TA-62A | Duplex Electrical Outlet (in splash) |
| TA-62B | Duplex Electrical Outlet (in countertop) |
| TA-64 | Urn Trough (per foot) |
| TA-70 | S/S Tubular Tray Divider |
| TA-71 | Heat Lamp Mounting Provision |
| TA-87 | Enclosed Backslash (per foot) |
| TA-88 | Tubular Tray Rail |
| TA-91 | Poly Retaining Clips (S/S top table) |
| TA-92 | 10" Apron (in front of sink, per foot) |
| TA-96 | Can Opener Provision |

| Model # | y |
|---|---|
| TA-22 | |
| TA-27 | |
| TA-30 | |
| TA-31 | |
| TA-32 | |
| TA-33 | |
| TA-34 | |
| TA-35 | |
| TA-36 | |
| TA-37 | |
| TA-38 | |
| TA-39 | |
| TA-40 | |
| TA-44 | |
| TA-45 | |
| TA-60 | |
| TA-61 | |
| TA-62 | |
| TA-62A | |
| TA-62B | |
| TA-64 | |
| TA-70 | |
| TA-71 | |
| TA-87 | |
| TA-88 | |
| TA-91 | |
| TA-92 | |
| TA-96 | |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ADVANCE TABCO

# SINK ACCESSORIES

ITEM #21

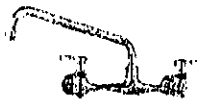
*Item #:* Part of #26

*Model #:*

*Project#:*

**Splash Mounted Faucet**
8" O.C.

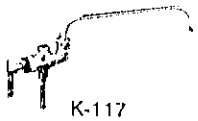
K-1 12" Spout
K-11 14" Spout
K-101 8" Spout
K-119 16" Spout



**Splash Mounted Faucet**
X.H.D.m 8" O.C.

K-111 14" Spout
K-112 12" Spout
K-118 8" Spout

**Faucet**
12" Spout



K-117
Add-A-Faucet

**Deck Mounted Faucet**

K-52
Gooseneck
4" O.C.

**Deck Mounted Faucet**

K-121
Gooseneck

**Prerinse Faucet**

K-116
8"O.C.

Wall Bracket Included

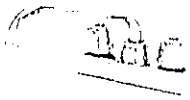
Splash Mtd.

**Splash Mounted X.H.D. Faucet**

K-211
18" Swing Spout
8" O.C.

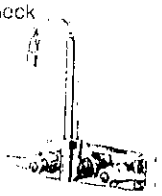
**Deck Mounted Faucet**

K-50
8" Spout
4" O.C.



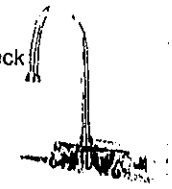
**Splash Mounted Faucet**

K-59
Gooseneck
8" O.C.



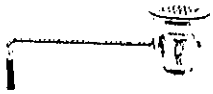
**Splash Mounted X.H.D. Faucet**

K-69
Gooseneck
8" O.C.



**Lever Operated Drain**

K-5
Twist Handle 2" IPS



**Lever Operated Drain**

K-15
Twist Handle
Built-In Overflow 2" IPS

**Basket Type Drain**

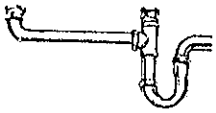
K-6
1 1/2" IPS

**Pedal Valve**

K-10
Combo. H/C
Double Pedal

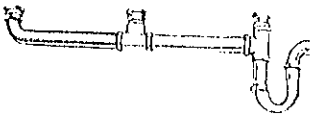
**Continous Waste - 2 Comp.**

K-341



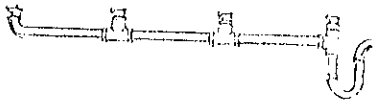
**Continous Waste - 3 Comp.**

K-351



**Continous Waste - 3 Comp.**

K-361



| | |
|---|---|
| K-00 | Repair Kit for K-1,K-11,K-101,K-119 & K-211 |
| K-2 | Poly-Vance Sink Cover |
| K-3 | Poly-Vance Cutting Board (3/4") |
| K-06 | Faucet Mounting Kit for K-1,K-11,K-101, K-119& K-211 |
| K-7 | Anti-Siphon Vacuum Breaker |
| K-8 | Backflow Preventer |
| K-20 | Plastic lever Drain |
| K-27 | P-Trap Chrome Plated. |
| K-40 | Specline Lever Drain |
| K-62 | Extra Heavy Duty Gooseneck |
| K-114 | Replacement Spray Head & Handle |
| K-115 | Deckmounted Prerinse Faucet |
| K-397 | Wall Bracket for Regaline Sink |
| K-455 | Stainless Steel Sink Cover |
| K-470A | 14" Deep 16" x 20" **Deep Drawn** Bowl |
| K-470B | 14" Deep 20" x 20" **Deep Drawn** Bowl |
| K-470C | 14" Deep 24" x 24" **Deep Drawn** Bowl |
| K-470D | 14" Deep 20" x 28" **Deep Drawn** Bow. |
| K-474 | 300 Series S/S Legs w/Metal Bullet Feet |
| K-475 | S/S Legs with Metal Bullet Feet |
| K-478 | Stainless Steel Bullet Foot |
| K-479 | Stainless Steel Undershell |
| K-488 | Flanged Bullet Foot |
| K-492 | Corner Drains with Swill Guard |
| K-493 | 300 Series S/S Welded Leg Assembly with Metal Bullet Feet |
| K-494 | Stainless Steel Welded Leg Assembly with Metal Bullet Feet |
| K-582 | Water Level Embossed (14" deep sinks only) |

| Model # | Qty |
|---|---|
| K-00 | |
| K-06 | |
| K-1 | |
| K-2 | |
| K-3 | |
| K-4 | |
| K-5 | |
| K-6 | |
| K-7 | |
| K-8 | |
| K-11 | |
| K-15 | |
| K-20 | |
| K-27 | |
| K-40 | |
| K-50 | |
| K-52 | |
| K-55 | |
| K-59 | |
| K-62 | |
| K-69 | |
| K-101 | |
| K-103 | |
| K-111 | |
| K-112 | |
| K-114 | |
| K-115 | |
| K-116 | |
| K-117 | |
| K-1118 | |
| K-119 | |
| K-121 | |
| K-211 | |
| K-341 | |
| K-351 | |
| K-361 | |
| K-397 | |
| K-455 | |
| K-470A | |
| K-470B | |
| K-470C | |
| K-470D | |
| K-474 | |
| K-475 | |
| K-478 | |
| K-479 | |
| K-488 | |
| K-492 | |
| K-493 | |
| K-494 | |
| K-582 | |


ADVANCE TABCO

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200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com

Qty. _____ Item No. _____

HOBART
FOOD EQUIPMENT

#23

• 6460
PEELER

# 6430 • 6460 PEELER

**SAVE TIME**
**SAVE WORK**
**SAVE FOOD**

Two stainless steel vegetable peelers loaded with features that meet these important kitchen needs . . . speed, no flats or bruising, reduced waste, gentle action. In three minutes or less the Models 6430 and 6460 will peel a full load of potatoes, carrots or other root vegetables.

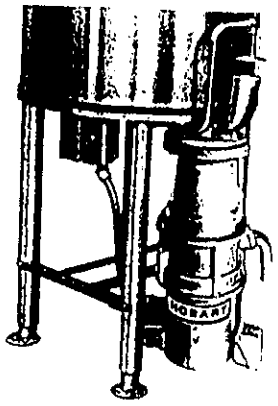
These peelers have a large disc made of durable reinforced plastic—not cast iron—with the abrasive permanently bonded to its surface. Bigger but lighter—actually weighs 48% less than the ordinary cast iron type. No struggling to remove this disc for cleaning.

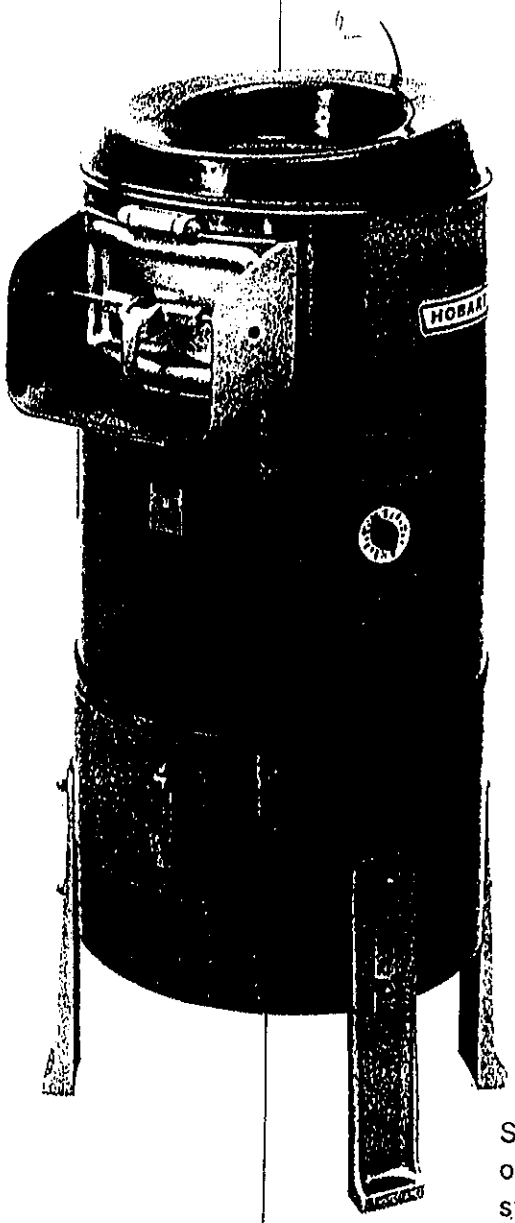
Convenience features, such as built-in peel trap, lock-on hopper cover, adjustable legs, and centralized controls make these Hobart Peelers a must for modern kitchens. Hopper with abrasives permanently bonded to its interior surface, insures constant rotation of vegetables. All combine to let you tailor this peeler to your kitchen needs.

**DISPOSER STAND** with stainless steel legs and four bolt-down adjustable, leveling feet permit installation of food waste disposer for Hobart Models 6430 & 6460. Permits continuous drain disposal of all peelings. (Peelers with stand, with or without disposer, not submitted for UL listing.) Stand is furnished with solenoid water control valve and air-gap type inlet.

Hobart Model FD2-50 with long upper housing Disposer, in single phase voltages below 250V. Specifically designed for use with the 6430 and 6460 peelers. (See illustration at right.)

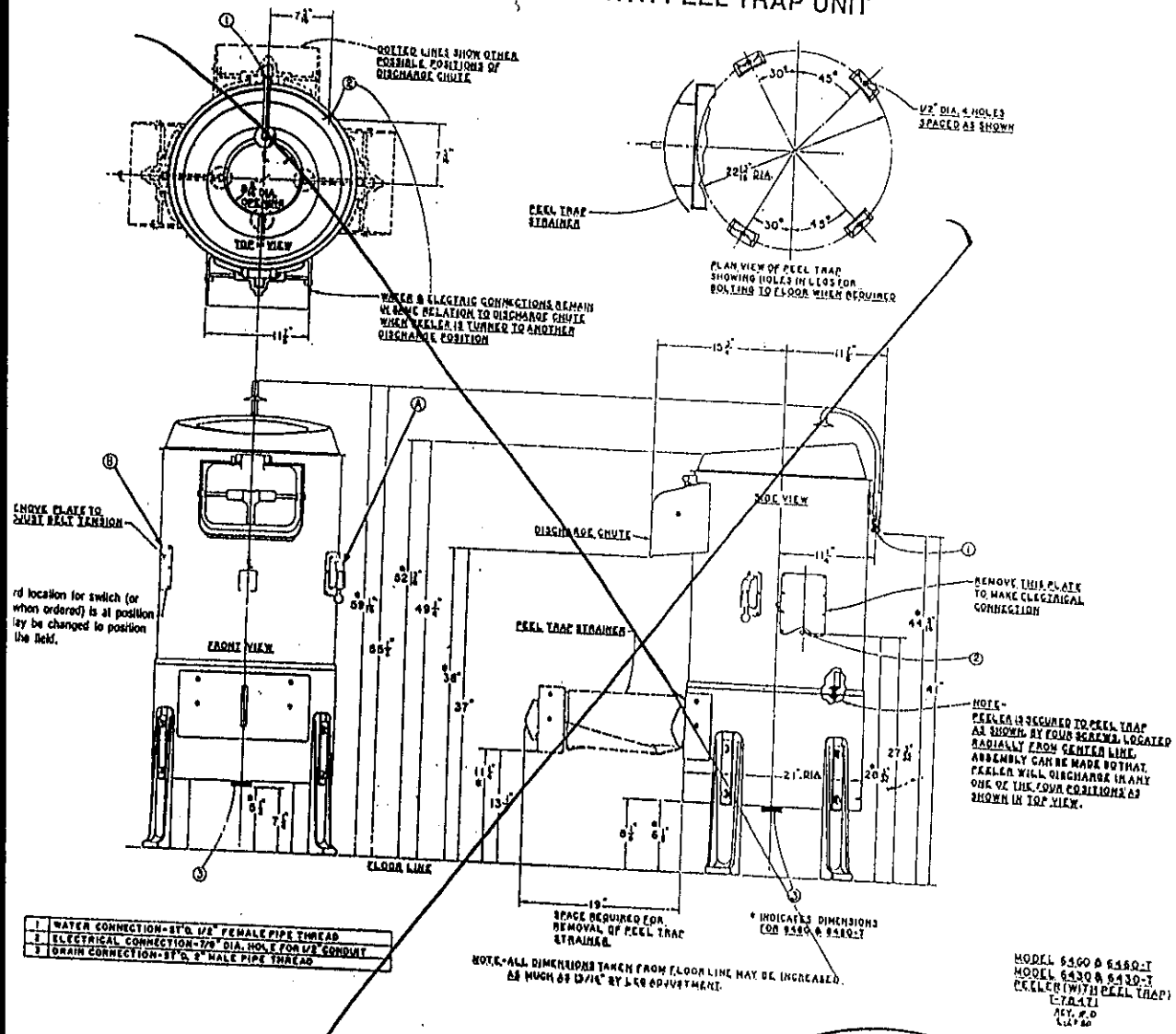
Specifications, Details and Dimensions on Reverse Side.





Shown with optional peel strainer and trap.

## DETAILS, DIMENSIONS AND CONNECTIONS
## PEELER WITH PEEL TRAP UNIT




| | |
|---|---|
| 1 | WATER CONNECTION-ST'D. 1/2" FEMALE PIPE THREAD |
| 2 | ELECTRICAL CONNECTION-7/8" DIA. HOLE FOR 1/2" CONDUIT |
| 3 | DRAIN CONNECTION-ST'D. 2" MALE PIPE THREAD |

—Approx. Shipping Weight Peeler and Peel Trap Unit —201 lbs.
Approx. Shipping Weight Peeler less Peel Trap Unit —147 lbs.
Net Weight of Peeler and Peel Trap Unit —190 lbs.

6460—Approx. Shipping Weight Peeler and Peel Trap Unit —210 lbs.
Approx. Shipping Weight Peeler less Peel Trap Unit —156 lbs.
Net Weight of Peeler and Peel Trap Unit —198 lbs.

NSF UL

WARNING
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES IN FORCE. PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES IN FORCE.

#23

# 6430 • 6460 PEELER

HOBART
FOOD EQUIPMENT

**SPECIFICATIONS** Listed by Underwriters Laboratories Inc and National Sanitation Foundation

**MOTOR:** ¾ H.P. Model 6430; 1 H.P. Model 6460. The motor features manual reset overload protection, grease-packed ball bearings, and ventilation within the peeler enclosure. Single phase is capacitor-start, induction run, and three phase is polyphase, squirrel-cage, induction-run type.

**ELECTRICAL SPECIFICATIONS:** 115/60/1, 200-230/60/1, 200-230/60/3, 460/60/3 UL Listed. 115/50/1, 220-240/50/1, 220-240/50/3, 380-415/50/3—Not submitted for UL Listing.

**SWITCH:** Manual tumbler type, located on right side of discharge chute as standard. Switch can be relocated to other side of chute if desired.

**TIMER—Models 6430T and 6460T:** Synchronous 4-minute timer, adjustable for any increments from ½ minute up to 4 minutes, with 15-second markings etched on a large timer dial. This timer is furnished only in single phase specifications as standard.

**DRIVE:** Multigrip, poly V-belt provides the direct speed reduction between motor and peeling disc. Belt adjustment may be accomplished from outside the machine. The stainless steel drive shaft is rigidly mounted [illegible]-packed ball bearings. Advanced [illegible]riple protection sealing prevents [illegible] water into shaft bearings.

**PEELER UNIT:** Cylindrical construction, heliarc-welded stainless steel with abrasive permanently bonded on interior surface of peeling hopper. A one piece, reinforced plastic molded, lightweight, easily removable, positive locking hopper cover is provided for easy cleaning. Quick-opening-removable aluminum hopper door and positive, cam-type pressure lock. Discharge chute is cast aluminum. To facilitate installation, the peeler unit can be positioned at 90° intervals, in relation to the peel trap unit.

**ABRASIVE DISC:** An extremely lightweight fiberglass reinforced plastic disc is 20½ inches in diameter. The silicon-carbide abrasive is permanently bonded to the disc, assuring unequaled long service. Disc can be easily and quickly removed for cleaning by removing the lightweight hopper cover. Two angle mounted wipers provide positive movement of waste into the outlet.

**OPTIONAL EQUIPMENT:**

☐ **PEEL TRAP UNIT:** This unit consists of a base, strainer and legs.

**BASE**—Constructed with a closed top which prevents moisture from entering motor and drive unit. The sloping bottom insures the diversion of water into a two inch male drain pipe connection.

**STRAINER**—The standard strainer has a stainless steel front and stainless steel rectangular drawer. The bottom of the drawer is removable for easy cleaning.

**LEGS**—There are four adjustable cast aluminum legs. The working height of the machine is 37" from the floor to the bottom of the discharge chute. The legs can be adjusted 13/16" to compensate for floor variations.

**WATER INLET:** The inlet is the air-gap type, mounted at the rear of the peeler unit at sufficient height to meet plumbing codes. The water from the inlet impinges on the curved surface of the hopper cover to form a fan pattern of water into the unit. This design promotes interior self-cleaning and forms a water curtain which prevents undesirable splash.

**WORKING CAPACITY:** Model 6430 peels 30-33 pounds in one to three minutes. Model 6460 Peeler peels 50-60 pounds in similar time.

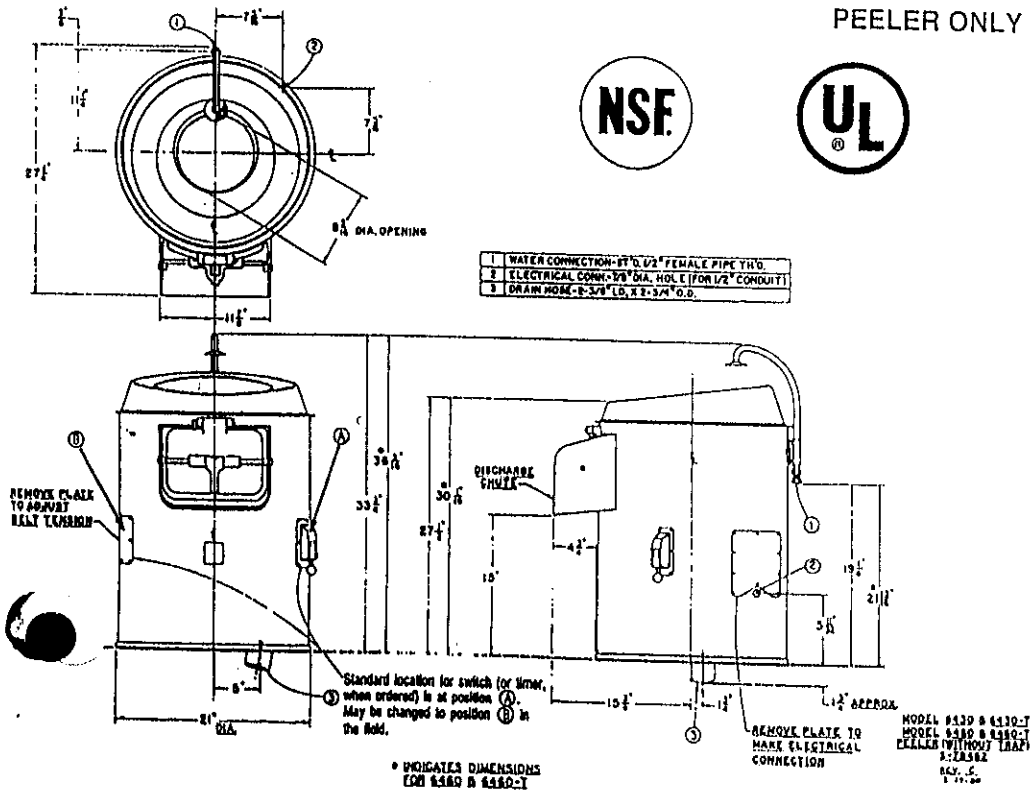
**FINISH:** Peeler and peel trap unit are #4 polished satin-finished stainless steel. Plastic molded hopper cover is gray. Door and handle, discharge chute, and legs are cast aluminum and ball burnished for durability. Bottom of peeler unit is cushioned in resilient rubber trim molding.

As continued product improvement is a policy of Hobart, specifications are subject to change without notice.

## DETAILS, DIMENSIONS AND CONNECTIONS PEELER ONLY

NSF

UL




WARNING

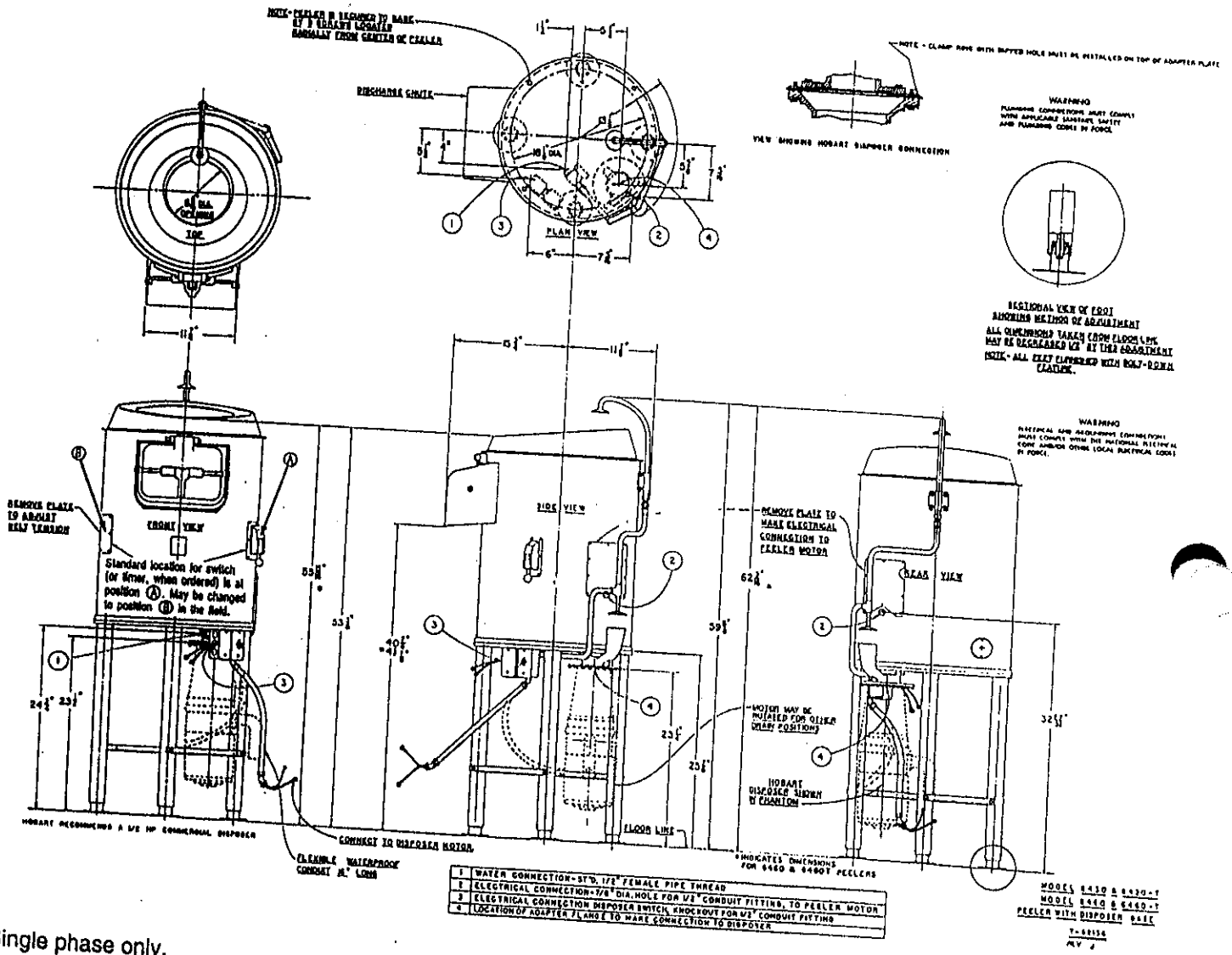
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES IN FORCE. PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES IN FORCE.

HOBART CORPORATION

EXECUTIVE OFFICES
TROY, OHIO 45374

FORM F-7502 (REV. 496)

## DETAILS, DIMENSIONS AND CONNECTIONS OF PEELER WITH DISPOSER STAND




Single phase only.
**DO NOT** use three phase disposers.

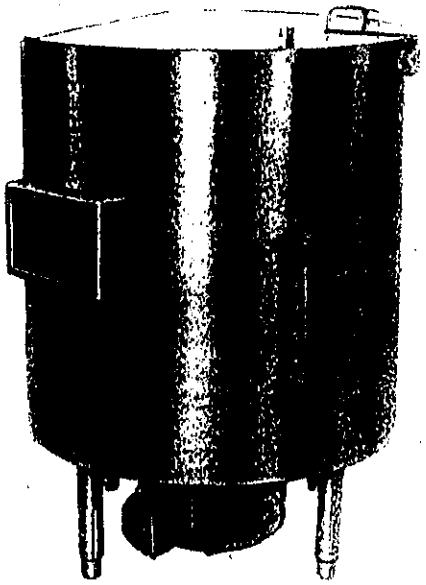
| | |
|---|---|
| 6430 —Net Weight of Peeler | —142 lbs. |
| —Domestic Shipping Weight of Peeler | —147 lbs. |
| 6460 —Net Weight of Peeler | —150 lbs. |
| —Domestic Shipping Weight of Peeler | —156 lbs. |
| 6430 —Net Weight of Disposer Stand | —58 lbs. |
| —Domestic Shipping Weight of Disposer Stand | —65 lbs. |
| 6460 —Net Weight of Disposer Stand | —60 lbs. |
| —Domestic Shipping Weight of Disposer Stand | —70 lbs. |

NOTE—Disposer Stand shipped in Carton separate from Peeler

WARNING
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES IN FORCE. PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY AND PLUMBING CODES IN FORCE.

# somat®

## Remote Waste Pulping System



## Description

Standard SOMAT™ Model SP-75S HT high tank pulper, hinged lid with limit switch, single trough connection, 3 HP or 5 HP slurry pump, valve package, Som-A-Trol™ control panel with water level control, push button station.

### Benefits

- Up to 80% volume reduction
- Reduced labor cost
- Better sanitation
- Water conservation
- Improved operator morale
- Reduced silverware loss
- Processes a wide variety of waste

**Operation:** Foodservice waste enters the pulping tank via the feed trough where it mixes with water, is processed and made into a slurry. The slurry, consisting of 5% solids and 95% water, is automatically transported through a pipeline to the Hydra-Extractor,™ where water is removed and the resultant semi-dry pulp is discharged into a haul-away container. The extracted water is recovered and returned to the pulping tank for re-use.

Somat equipment provides an economic and efficient answer to cutting the high and ever increasing costs associated with waste handling. Manufactured by Somat Corporation of Coatesville, Pennsylvania, originators of waste pulping systems and specialists in waste reduction technology.

**Approval:**

Item No. # 24

SOMAT Model: SP-75S HT
Pulper with trough connection

## Technical Specifications

**Pulper:** 30" diameter, 43" high polished stainless steel tank with feed trough connection and hinged lid with limit switch, 1/2" thick stainless steel slurry chamber, 7-1/2 HP TEFC direct drive motor, internal junk box and cutting mechanism. Cutting mechanism consists of a stainless steel 13-1/2" diameter impeller and stainless steel perforated sizing ring.

**Valve Package:** All valves required for proper operation (fresh water, trough flush and drain lines).

**Som-A-Trol™ (Electrical Control Panel):** UL approved. Includes all necessary electrical components prewired to a terminal strip; water level control and push button station, in a NEMA 12 carbon steel enclosure.

**Options Available:**
(see accessory sheet for description)

- ☐ Second feed trough connection
- ☐ Feed tray
- ☐ Feed tray cover
- ☐ NEMA 4 stainless steel Som-A-Trol
- ☐ Special electrical characteristics

**Special Requirements:**

- Dual water level control and motor operated valve with controls. Required if more than one pulper operating with a single Hydra-Extractor.
- Stainless Steel Dam. Required when pulper is located higher (one level minimum) than the Hydra-Extractor.

**Electrical Characteristics:** 208/230/460 Volt, 3 Phase, 60 Hertz

**Capacity:** 900 pounds per hour of foodservice waste mix, consisting of food scraps, plastics, milk cartons, paper, aluminum foil and cardboard.

**Finish:** All exterior surfaces, except where polished stainless steel, are prime coated and finished with two coats of enamel paint.

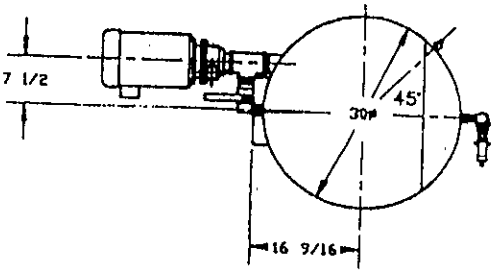
Equipment only is supplied by SOMAT Corporation; installation, piping and wiring is not included.

somat
waste reduction technology
555 Fox Chase, Suite 107
Coatesville, PA 19320 USA
(610) 384-7000
Fax: (610) 380-8500
1-800-23-SOMAT
www.somatcorp.com

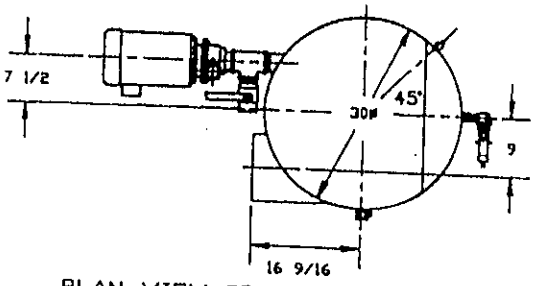
# somat®

## Remote Waste Pulping System

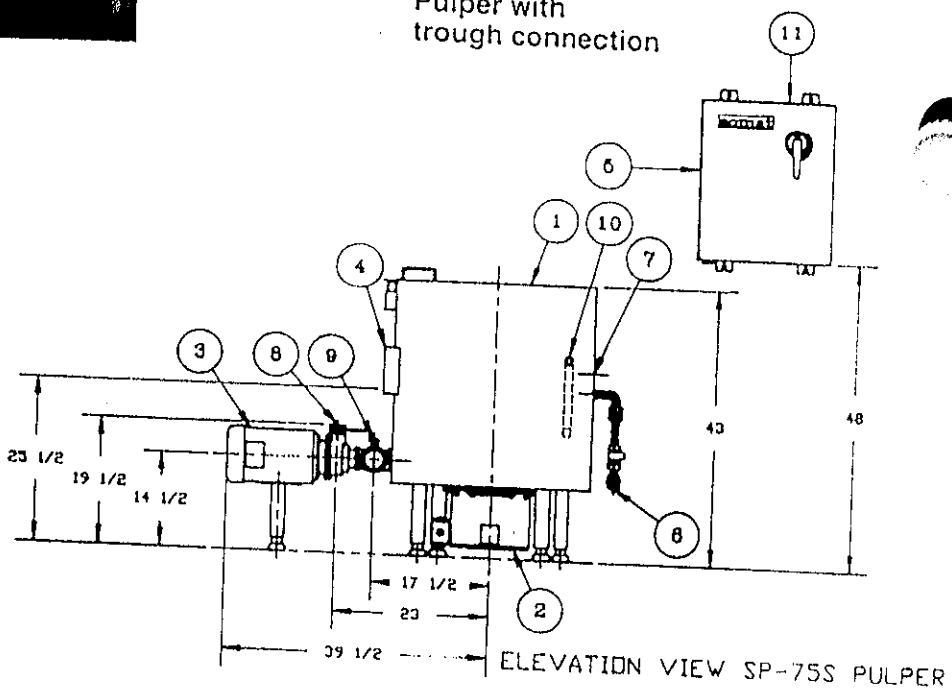
Pulper with
trough connection




PLAN VIEW SP-75S PULPER
WITH CENTERLINE TROUGH ENTRY




PLAN VIEW SP-75S PULPER
WITH TANGENTIAL TROUGH ENTRY




ELEVATION VIEW SP-75S PULPER

Feed trough connection may be rotated in 45° increments from shown
Utility rough ins may vary with final configuration
Return & slurry piping assemblies not shown.
Unit shown with 3 hp. slurry pump and without dam.

**Enlarge drawing by 129% to achieve 1/2" scale.**
**Reduce drawing by 64% to achieve 1/4" scale.**
***A complete CAD library is now available.***

## Somat Model SP-75S HT Pulper including:

Pulper tank w/hinged lid & limit switch
Pulper drive motor, 7 1/2 hp
Slurry pump, 3 hp or 5 hp

4 Feed trough connection, w/required trough nozzles
5 Som-A-Trol panel (24"h x 20"w x 8"d) with push button station

## Utility Connections:

Fresh water inlet, 3/4" npt
Return water inlet, 2" npt
Slurry pump outlet, 2" npt

9 Drain valve, 2" npt
10 Water level standpipe, 3/8" line to Som-A-Trol
11 Customer power supply (4 wire service required)

## Dimensions:

**Height:** 45" (1145 mm)
**Length:** 55" (1400 mm)
**Width:** 30" (765 mm)

**Equipment Weight/Operating Weight:** 525 lbs./745 lbs.
**Crated Weight:** 850 lbs.
**Crated Volume:** 85 cu. ft.

## Utility Requirements:

Fresh water, 18 gpm @ 30 psig, 3/4" npt (approximate usage 135 gph)
Drain, 3" min. floor sink w/stainless steel removable basket.
Power, 208V-50 amps; 230V-50 amps; 460V-30 amps, 3 phase, 60 Hz.
(disconnect with circuit breaker provided in Som-A-Trol)

You'll find us in **First Place.**


TRADEMARK NOTICE: SOMAT, SOM-A-PRESS, HYDRA EXTRACTOR, SOM-A-
and SOM-A-SHEAR are registered trademarks of Somat Corporation
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reserves the right to change specifications without notice


somat®
waste reduction technology


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Fax: (610) 380-8500
1-800-23-SOMAT
www.somatcorp.com
somatcorp@aol.com

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ITEM #26

ADVANCE TABCO

# Convert Your Table into a Effective Work Station!

## *Maximize Your Work Area!*

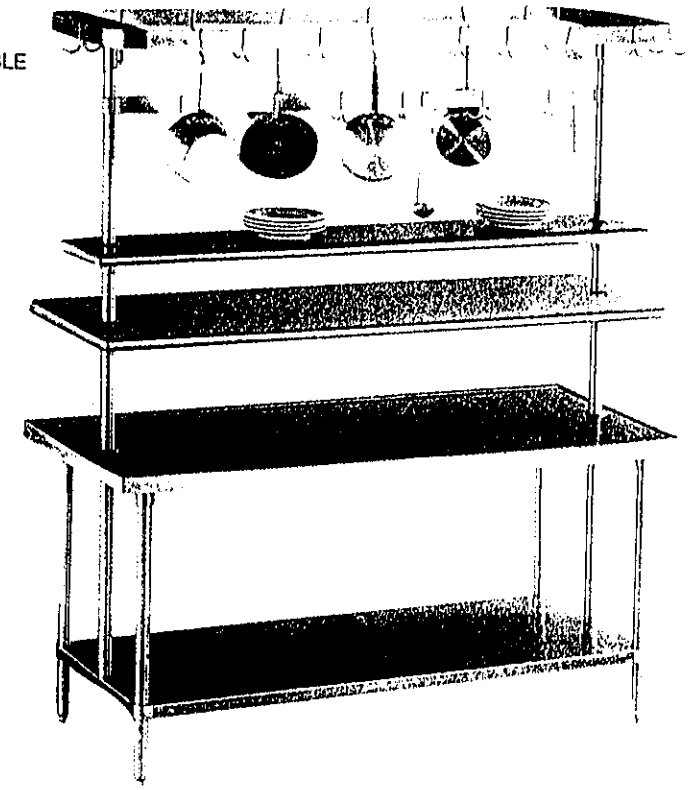
### Our TABLE with POT RACK, SHELVING & UTENSIL RACK

Utensil Rack is FULLY ADJUSTABLE

Select the SHELF WIDTH to satisfy your needs

Stainless Steel 1 5/8" diameter TUBULAR UPRIGHTS

Easy SHELF MOUNTING for ADDITIONAL RIGIDITY



Plated Pot Hooks

Pot Rack is ADJUSTABLE Maximum Height = 84" (A.F.F.)

Rolled Rim 4 sides

Shelves are ADJUSTABLE to meet your requirements

Only ONE support thru Table Top . . . Maximizes your working area

MID MOUNT DESIGN

## YES!!! . . . IT'S ADJUSTABLE

**Mix & Match** . . . . . your choice. We offer 3 basic components: SHELF - POT RACK - UTENSIL RACK.

**The Adjustable Solution** . . . . . components are adjustable. You set the height to meet your demanding requirements.

**Focus on Function** . . . . . available in 4 shelf widths, 2 pot rack styles, 10 lengths, and 1 utensil rack series.


ADVANCE TABCO

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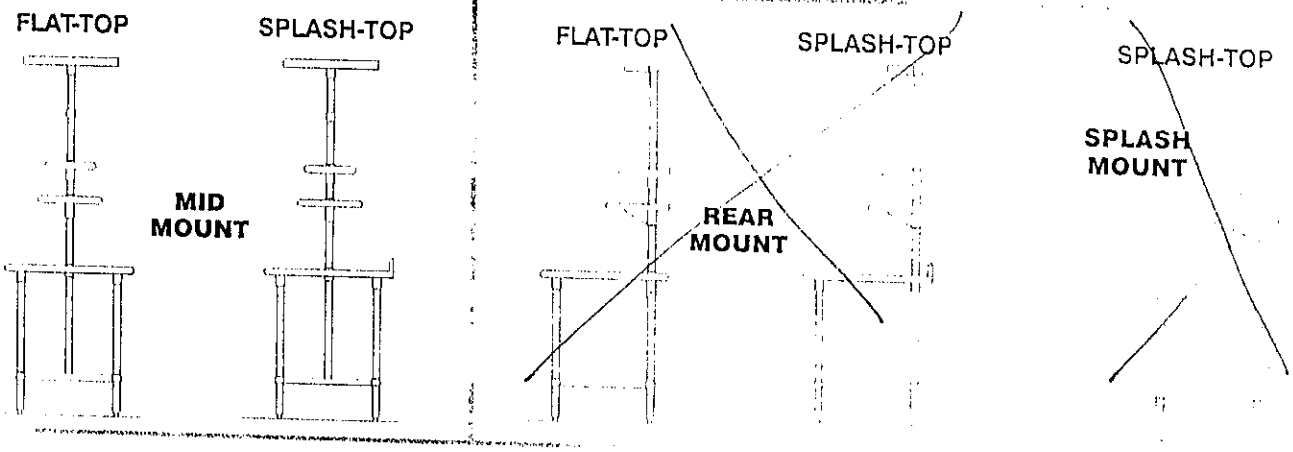
200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com www.advancetabco.com

# DESIGNED & CONSTRUCTED so as to be a Self-Contained Unit

## Possible ADJUSTABLE Solutions for




**Also . . . . Adaptable to ALL ADVANCE TABCO Open - Base (less undershelf) Units.**

## SHELF SPECIFICATIONS:

**REAR MOUNT & SPLASH MOUNT DESIGN:**
Shelves feature a 1 1/2" splash on rear edge with rolled rim on front edge and square sides.

**MID MOUNT DESIGN:**
Shelves feature a rolled rim on front and rear.

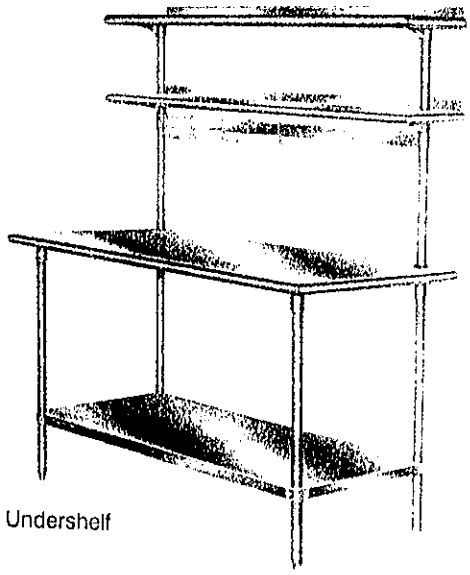
| TUBULAR UPRIGHT DIMENSIONS | |
|---|---|
| furnished with units requiring pot racks, shelves and utensil rack. (Dim. A.F.F.) | 84" |
| furnished with units requiring ONLY shelving. (Dim. A.F.F.) | 60" |
| furnished with units requiring field retofit to include pot rack. Model TA-225 (ext. assembly) | 24" |
| A.F.F. = Above Finished Floor. | |

## SINGLE POST DESIGN

### TABLE with OVERHEAD SHELVES

MIX & MATCH Shelf Widths

Rolled Rim on Front Edge



1" Splash on Rear Edge

Stainless Steel TUBULAR UPRIGHTS

Square Edge Sides

Plated Pot Hooks

REAR-MOUNT DESIGN

Full Worktable Undershelf

*Call TOLL FREE the location nearest you*

# SPECIFICATIONS

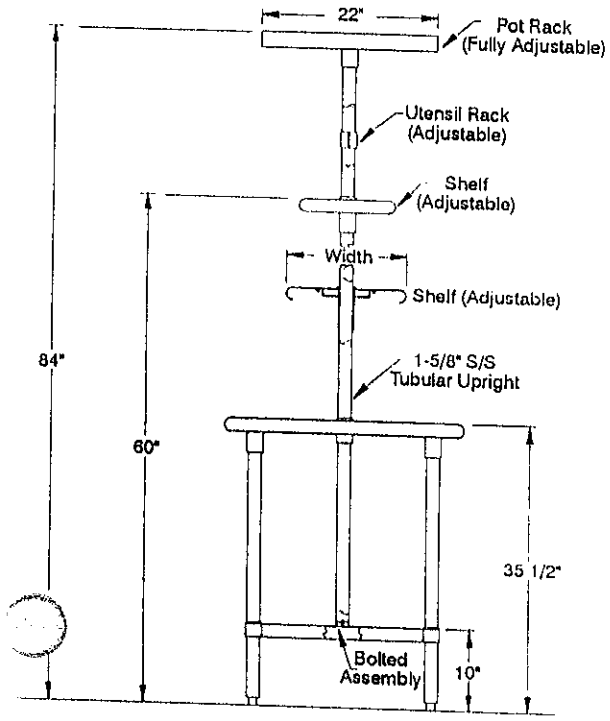
#26

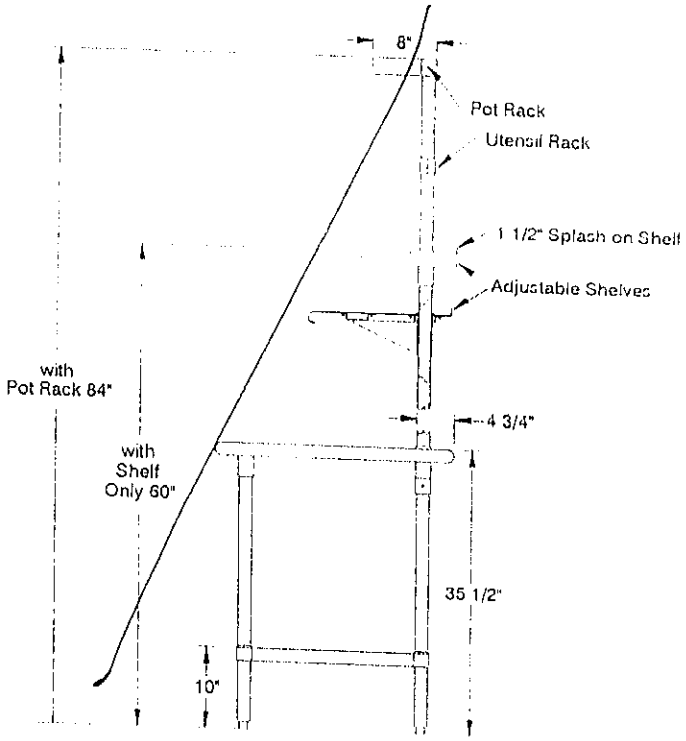
## TABLE with SHELVES, POT RACK & UTENSIL RACK

### MID-MOUNT INSTALLATION

### REAR-MOUNT INSTALLATION

Suggested Heights an Typical Installations

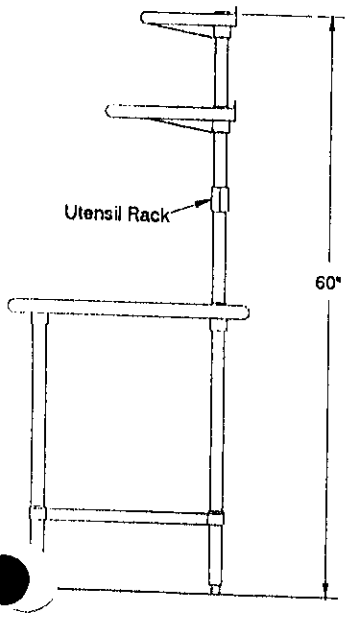



ALL DIMENSIONS ARE TYPICAL

A.F.F. = Above Finished Floor

### Table Mounted Shelf Installation




## DESIGN:

SHELVES, POT & UTENSIL RACKS are adjustable along a single tubular upright at each and of the table.

Gusset type SET SCREW LOCKING MECHANISMS are employed to secure in place.

HAT SECTIONS and ANGLE BRACKETS, where required, are supplied to insure a rigid and level working surface.

## MATERIAL:

SHELVES, POT & UTENSIL RACKS, HAT SECTION and GUSSETS are stainless steel.

## SHELF DESIGN:

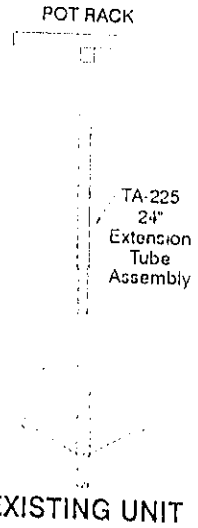
MID-MOUNTED SHELVING UNITS are furnished with a roll rim edge on front and rear sides.

REAR & SPLASH MOUNTED SHELVING UNITS are furnished with a roll rim edge in front. Ends are square edged formed downward and rear edge is turned up to form a rear splash.

## CONSTRUCTION:

TIG welded with exposed areas ploished to match adjacent surfaces.

**Units originally supplied with OVERHEAD SHELVING can be adapted on the field to receive a POT RACK.**




ADVANCE TABCO

200 Heartland Boulevard, Edgewo[illegible] 11717-8380

ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.

# MODELS - DIMENSIONS - WEIGHTS

*Choose a SHELF or SHELVES - POT RACK - UTENSIL RACK and one of the following Mounting Provisions:*

**TA-229 = REAR MOUNT**
**TA-228 = MID MOUNT**
**TA-227 = SPLASH MOUNT**

NOTE: Adjustable utensil rack is always supplied when ordering POT RACK.

**TA-225 = EXTENSION TUBE ASSEMBLY**

FACTORY INSTALLATION REQUIRED OF MOUNTING ASSEMBLY.

## SHELVING MODELS

| WIDTH | Length | MID MT. | REAR MT. | SPLASH MT. | Est. Wt. |
|---|---|---|---|---|---|
| 10" | 36" | PT-10-36 | PT-10R-36 | PT-10S-36 | 12 lbs. |
| | 48" | PT-10-48 | PT-10R-48 | PT-10S-48 | 14 lbs. |
| | 60" | PT-10-60 | PT-10R-60 | PT-10S-60 | 17 lbs. |
| | 72" | PT-10-72 | PT-10R-72 | PT-10S-72 | 19 lbs. |
| | 84" | PT-10-84 | PT-10R-84 | PT-10S-84 | 22 lbs. |
| | 96" | PT-10-96 | PT-10R-96 | PT-10S-96 | 26 lbs. |
| | 108" | PT-10-108 | PT-10R-108 | PT-10S-108 | 28 lbs. |
| | 120" | PT-10-120 | PT-10R-120 | PT-10S-120 | 31 lbs. |
| | 132" | PT-10-132 | PT-10R-132 | PT-10S-132 | 35 lbs. |
| | 144" | PT-10-144 | PT-10R-144 | PT-10S-144 | 38 lbs. |
| 12" | 36" | PT-12-36 | PT-12R-36 | PT-12S-36 | 13 lbs. |
| | 48" | PT-12-48 | PT-12R-48 | PT-12S-48 | 15 lbs. |
| | 60" | PT-12-60 | PT-12R-60 | PT-12S-60 | 18 lbs. |
| | 72" | PT-12-72 | PT-12R-72 | PT-12S-72 | 20 lbs. |
| | 84" | PT-12-84 | PT-12R-84 | PT-12S-84 | 23 lbs. |
| | 96" | PT-12-96 | PT-12R-96 | PT-12S-96 | 27 lbs. |
| | 108" | PT-12-108 | PT-12R-108 | PT-12S-108 | 29 lbs. |
| | 120" | PT-12-120 | PT-12R-120 | PT-12S-120 | 32 lbs. |
| | 132" | PT-12-132 | PT-12R-132 | PT-12S-132 | 36 lbs. |
| | 144" | PT-12-144 | PT-12R-144 | PT-12S-144 | 39 lbs. |
| 15" | 36" | PT-15-36 | PT-15R-36 | PT-15S-36 | 15 lbs. |
| | 48" | PT-15-48 | PT-15R-48 | PT-15S-48 | 17 lbs. |
| | 60" | PT-15-60 | PT-15R-60 | PT-15S-60 | 20 lbs. |
| | 72" | PT-15-72 | PT-15R-72 | PT-15S-72 | 22 lbs. |
| | 84" | PT-15-84 | PT-15R-84 | PT-15S-84 | 25 lbs. |
| | 96" | PT-15-96 | PT-15R-96 | PT-15S-96 | 29 lbs. |
| | 108" | PT-15-108 | PT-15R-108 | PT-15S-108 | 31 lbs. |
| | 120" | PT-15-120 | PT-15R-120 | PT-15S-120 | 34 lbs. |
| | 132" | PT-15-132 | PT-15R-132 | PT-15S-132 | 38 lbs. |
| | 144" | PT-15-144 | PT-15R-144 | PT-15S-144 | 41 lbs. |
| 18" | 36" | PT-18-36 | PT-18R-36 | PT-18S-36 | 17 lbs. |
| | 48" | PT-18-48 | PT-18R-48 | PT-18S-48 | 19 lbs. |
| | 60" | PT-18-60 | PT-18R-60 | PT-18S-60 | 22 lbs. |
| | 72" | PT-18-72 | PT-18R-72 | PT-18S-72 | 24 lbs. |
| | 84" | PT-18-84 | PT-18R-84 | PT-18S-84 | 27 lbs. |
| | 96" | PT-18-96 | PT-18R-96 | PT-18S-96 | 31 lbs. |
| | 108" | PT-18-108 | PT-18R-108 | PT-18S-108 | 33 lbs. |
| | 120" | PT-18-120 | PT-18R-120 | PT-18S-120 | 36 lbs. |
| | 132" | PT-18-132 | PT-18R-132 | PT-18S-132 | 40 lbs. |
| | 144" | PT-18-144 | PT-18R-144 | PT-18S-144 | 43 lbs. |

## POT RACKS

(includes adjustable utensil rack)

| SIZE | MID Mount | REAR Mount SPLASH Mount | Est. Wt. |
|---|---|---|---|
| 36" | SCT-36 | SWT-36 | 30 lbs. |
| 48" | SCT-48 | SWT-48 | 34 lbs. |
| 60" | SCT-60 | SWT-60 | 37 lbs. |
| 72" | SCT-72 | SWT-72 | 46 lbs. |
| 84" | SCT-84 | SWT-84 | 50 lbs. |
| 96" | SCT-96 | SWT-96 | 55 lbs. |
| 108" | SCT-108 | SWT-108 | 60 lbs. |
| 120" | SCT-120 | SWT-120 | 65 lbs. |
| 132" | SCT-132 | SWT-132 | 68 lbs. |
| 144" | SCT-144 | SWT-144 | 72 lbs. |
| 4 Hooks per Lineal Foot | | | |

## UTENSIL RACKS

| SIZE | MODEL # | Est. Wt. |
|---|---|---|
| 36" | AUR-36 | 10 lbs. |
| 48" | AUR-48 | 12 lbs. |
| 60" | AUR-60 | 14 bs. |
| 72" | AUR-72 | 16 lbs. |
| 84" | AUR-84 | 18 lbs. |
| 96" | AUR-96 | 20 lbs. |
| 108" | AUR-108 | 22 lbs. |
| 120" | AUR-120 | 24 lbs. |
| 132" | AUR-132 | 26 lbs. |
| 144" | AUR-144 | 28 lbs. |
| 2 Hooks per Lineal Foot | | |

ADVANCE TABCO

**NEW YORK**
(800) 645-3166
Fax: (516) 242-6900

**GEORGIA**
(800) 832-1218
Fax: (770) 775-5625

**TEXAS**
(800) 527-0353
Fax: (972) 932-4795

**NEVADA**
(800) 446-8684
Fax: (775) 972-1578

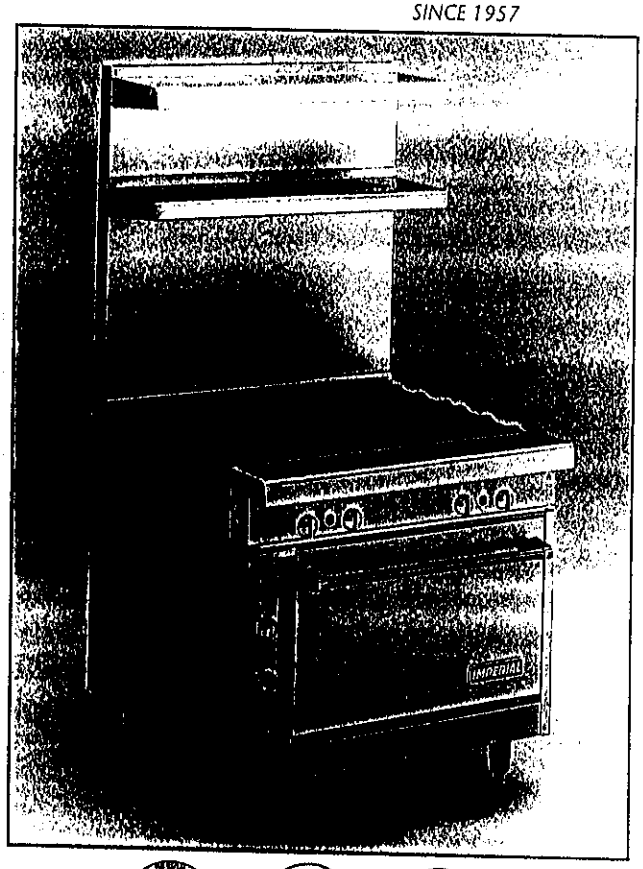
200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com www.advancetabco.com

Item # #27

IMPERIAL

SINCE 1957

# IHR SERIES
# HEAVY DUTY RANGE



## 4 OPEN BURNERS

- ❑ MODEL IHR - 4
- ❑ MODEL IHR - 4-C

*Imperial heavy duty ranges are built for rugged use and long life. Contemporary styling and innovative design create a gleaming, uniform appearance. The heavy gauge, double-wall, tapered flame spreader distributes heat evenly in the large capacity oven. Snap acting oven gas controls provide rapid heat up. A one piece 18"W x 28"D heavy cast iron top grate is provided over two burners that are rated at 30,000 BTU/hr. each and controlled individually by a gas valve.*

### Standard Features

- *Heavy duty 12 gauge welded frame construction.*
- *All stainless steel front.*
- *Black enamel sides.*
- *1-1/4" manifold pipe in front for battery installation.*
- *6" legs with adjustable feet.*
- *One year limited warranty on parts and labor.*
- *AGA design certified and NSF listed.*

### Top Section Features

- *One piece heavy duty cast iron top grate (18"W x 28"D) every 18".*
- *4 open burners rated at 30,000 BTU/hr. each.*
- *One standing pilot for each burner.*
- *Removable one-piece drip tray.*
- *7"D stainless steel front landing ledge.*

### Standard Oven Features

- *Porcelainized interior includes side, rear, deck and door linings.*
- *Oven interior dimensions 26-1/2"W x 28"D x 14"H.*
- *40,000 BTU/hr. oven burner with standing pilot.*
- *100% safety pilot.*
- *Controls on side in cool zone.*
- *Manual oven shut-off valve.*
- *Heavy duty thermostat with temperature range from 150°F to 500°F.*
- *Heavy duty oven door.*
- *One chrome-plated oven rack.*

### Convection Oven Features *(Add suffix "-C")*

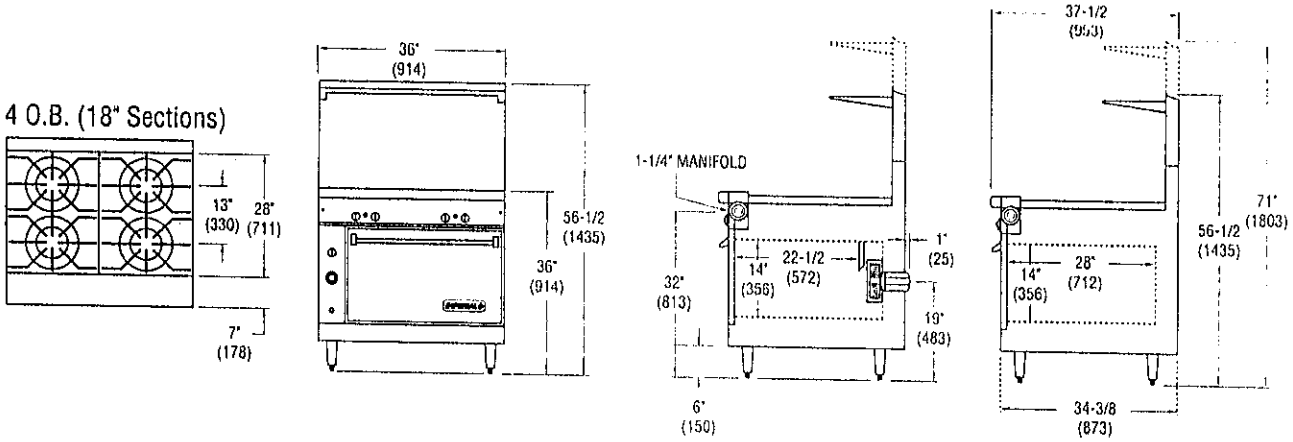
- *Porcelainized interior includes side, rear, deck and door linings.*
- *Oven interior dimensions 26-1/2"W x 22-1/2"D x 14"H.*
- *Three heavy duty steel chrome-plated racks supported by chrome-plated rack guides.*
- *Electric thermostat with 150° F to 500° F range.*
- *Oven burner rated at 35,000 BTU/hr. with electronic spark pilot ignition.*
- *Three position switch for cooking or 'cool down'.*
- *Burner "ON" indicator light.*
- *One hour manual timer.*
- *Fan shuts off automatically when door is open.*
- *1/4 HP, 1725 RPM blower motor (120 VAC - 60 Hz - 1 Ph) with 5 Amp draw.*
- *Provided with 3 prong 6 foot power cord.*

**IMPERIAL** Commercial Cooking Equipment *1560 Flower Street, Duarte, CA 91010*
*Phone (626) 357-7411 Fax (626) 359-5909*

# MODEL ❑ IHR - 4, ❑ IHR-4-C

## Available Options *(At Additional Cost)*

- ❑ *6" stub back, 17" backguard, or various high backguards - black or stainless steel.*
- ❑ *Single or double deck S/S high shelf.*
- ❑ *One piece common high shelf, backguard, and front landing ledge for battery line-up*
- ❑ *Reinforced backguard to mount ICMA series Infrared Cheesemelter or ISB-36 Salamander Broiler.*
- ❑ *Modular or storage base unit.*
- ❑ *Stainless steel sides.*
- ❑ *Swivel casters (Front two are locking).*
- ❑ *Gas pressure regulator.*
- ❑ *Rear gas connection.*
- ❑ *Gas shut off valve (specify size)*
- ❑ *Quick disconnect and flexible gas hose*




Convection Oven Base

Standard Oven Base

*Bracketed dimensions are in millimeters (mm).*

**Crated Dimensions:** *Standard and Convection Oven - 37" (940) W x 39" (991) D x 35" (889) H.*

**Gas:** *Manifold pressure is 5.0" W.C. for natural gas or 10.0" W.C. for propane gas. Specify type of gas and elevation if over 2,000 feet.*

**Clearances:** *For use only on non-combustible floors. Provide 0" from non-combustible walls, sides and rear, 8" from combustible wall at sides and 4" from combustible wall at rear.*

**Note:** *The unit must overhang 2" in the front, when installed without legs or casters on non-combustible curb. An appropriate size pressure regulator must be installed in the gas line for a single unit or group of units.*

| Model No. | Description | Total BTU | Ship Wt. | |
|---|---|---|---|---|
| | | | lbs | kgs |
| IHR - 4 | (4) Open Burners, Standard Oven | 160,000 | 590 | 268 |
| IHR - 4-C | (4) Open Burners, Convection Oven | 155,000 | 650 | 295 |

*Add Suffix "-XB" to model number for storage base.*
*Imperial Manufacturing reserves the right to change specifications without prior notice.*


IMPERIAL
Commercial Cooking Equipment
1560 Flower St., Duarte, CA 91010 Phone (626) 357-7411 FAX (626) 359-5909 E-Mail impsls@imperialrange.com Website imperialrange.com



(0593)
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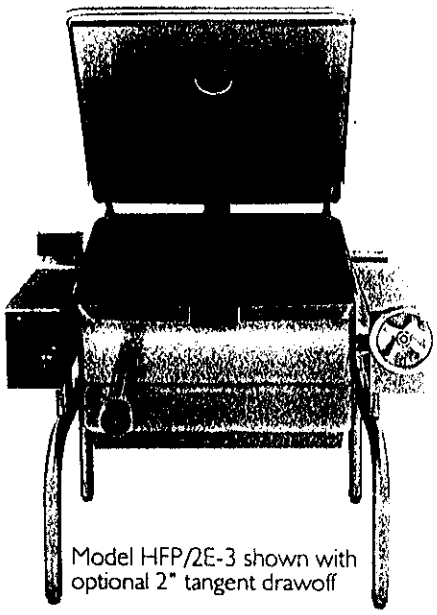
# HFP/2E

GROEN

ITEM #28

## Stainless Steel Manual Tilting Braising Pan

## Open Leg Gas Heated 23, 30 and 40 Gallon Capacity



Model HFP/2E-3 shown with optional 2" tangent drawoff

### Short Form

Groen Model HFP/2E stainless steel gas heated thermostatically controlled, open tubular leg braising pan per Bulletin 15E. Heavy ⅝" thick stainless steel clad pan bottom with patented gas burner/combustion chamber and specially designed heat transfer fins which deliver a 60-65% efficiency rating. Electronic ignition is standard, standing pilot an available option. (Available 42" 49" or 59" wide with a 9" deep pan.) Smooth action manual tilt mechanism, heavy duty cover with condensate drip diverter and cover vent standard. NSF listed and AGA design certified. ½" NPT gas connection required and standard electric spark ignition requires 115 Volt, single phase, 60 Hertz, 3 AMP service. Made in U.S.A.

### Description

Braising pan shall be a Groen Model HFP/2E open leg, gas heated, manual tilting braising pan [Specify (23 gallon) Model HFP/2E-2; (30 gallon) Model HFP/2E-3; or (40 gallon) Model HFP/2E-4] with 9" deep pan, per Bulletin 15E as follows:

### Construction

The pan body shall be of type 304 stainless steel, solid one-piece welded heavy duty construction, with 9" pan depth. All exposed surfaces shall be of stainless steel.

The cooking surface is a heavy ⅝" thick stainless steel clad plate with welded heat transfer fins, heated by the specially designed and patented gas burner/combustion chamber. This combination delivers more uniform heat transfer over the entire cooking surface. The heavy plate prevents warping or distortion. (SEE OPERATOR'S MANUAL FOR PROPER WARMUP SETTINGS).

Controls and tilt mechanism are mounted in stainless steel housings, on either side of the pan body. Unit shall come standard with holes for either right or left side faucet mounting.

### Finish

Interior of braising pan shall be polished to a 180 emery grit finish. Exterior of braising pan shall be finished to a bright high buff finish, ensuring maximum ease in cleaning and maintaining brilliant appearance.

### A.G.A. & C.G.A. Design Certification

Unit shall be design certified by the American Gas Association and the Canadian Gas Association.

### CE Models

CE approved models available. Contact factory.

### Sanitation

Unit shall be designed and constructed to meet NSF and known health department and sanitation codes and be NSF listed. True open leg tubular design and 3" radius pan corners make cleaning easier.

### Manual Tilt

The unit shall have an easy operating smooth action manual crank tilt mechanism which provides precise control during pouring of pan contents. Pan body shall tilt past vertical to assist in cleaning.

### Vented Cover

A heavy gauge one piece cover is standard with counterbalancing spring assisted actuator, designed to maintain the cover in an open or closed position. A vent is provided in the cover top to regulate condensate buildup and a rear condensate drip shield is located under the cover to prevent condensate from dripping on floor when cover is opened.

### Controls

Operating controls include left console mounted power-ON switch, power-ON indicator light, HEATing indicator light, electronic timer with TIMING and DONE lights; plus thermostat mounted in its own left rear control box.

### Performance/Features

Unit to be thermostatically controlled to automatically shut off when desired temperature is reached and to turn on when product temperature falls below desired setting.

Model HFP/2E-2 has a firing rate of 80,000 BTU/hr with a heat rate into product of 52,000 BTU/hr. Model HFP/2E-3 has a firing rate of 104,000 BTU/hr with a heat rate into product of 67,600 BTU/hr. Model HFP/2E-4 has 144,000 BTU/hr firing rate and 93,600 BTU/hr heat rate into the product for an energy efficiency rating of 60-65%.

Electronic intermittent ignition system for pilot standard.

### Installation

Unit requires ½" NPT gas connection. Requires one 115 Volt, single phase, 60 HZ, 3 AMP connection. **No electric connection is required if standing pilot option is ordered.**

### Options/Accessories

- ❑ REJ steamer pan inserts
- ❑ Water fill faucet with swing spout
- ❑ Steamer pan carrier (Model BPC)
- ❑ Standing pilot ignition (Model HFP/2)
- ❑ 2" Tangent drawoff
- ❑ Casters and gas quick connects
- ❑ Right and/or left mounted fold down pan supports

### Origin of Manufacture

Braising Pan shall be designed and manufactured in the United States.

### Applications

*Braising meat*
*Pan frying chicken*
*Asian stir-fry*
*Steaming vegetables*
*Frying short order items*
*Sauteing*
*Sauces/Roux*
*Roasting turkeys*
*Boiling*
*Simmering*
*Thawing*
*Reheating prepared foods*

A DOVER INDUSTRIES COMPANY

1055 Mendell Davis Drive
Jackson, Mississippi 39212
Telephone 601 372-3903
FAX: 601 373-9587

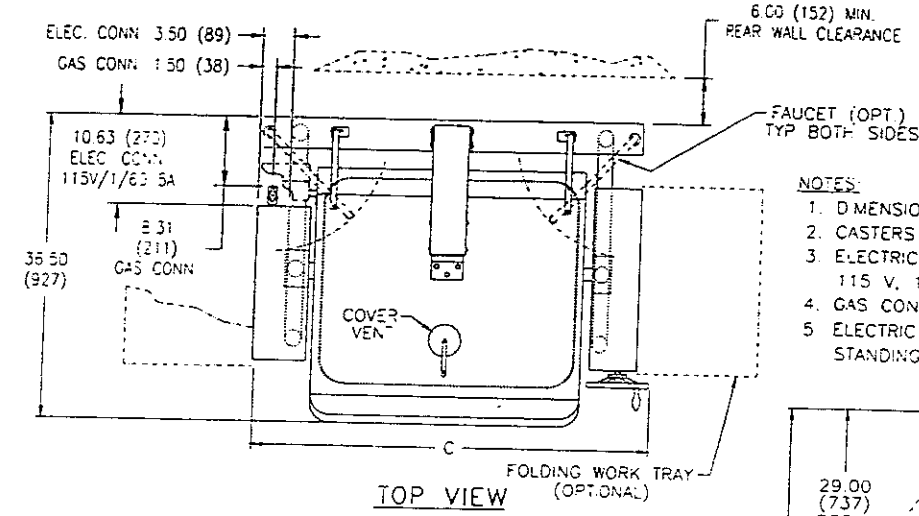
Groen, A Dover Industries Company
1055 Mendell Davis Drive
Jackson, Mississippi 39212
Telephone 601 372-3903
FAX: 601 373-9587

GROEN®

# HFP/2E

**Stainless Steel Manual Tilting Braising Pan**

**Due to continual product improvement, designs are subject to change without notice.**



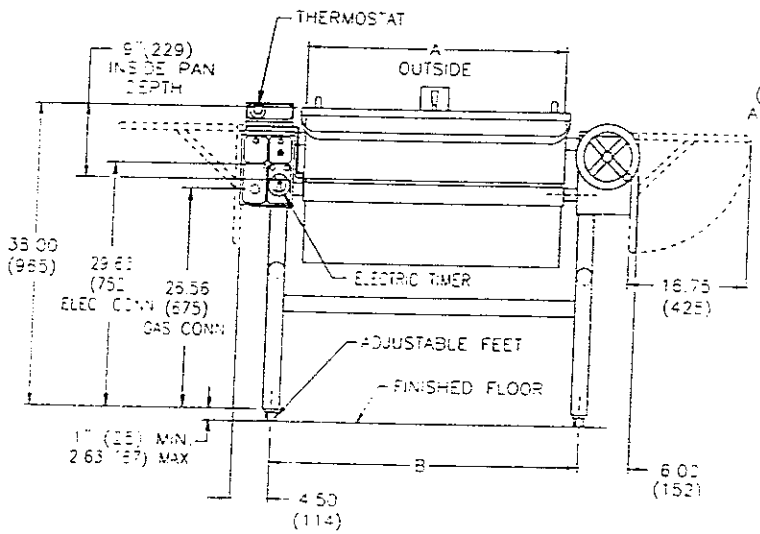

TOP VIEW

NOTES:
1. DIMENSIONS IN BRACKETS ( ) ARE MM.
2. CASTERS AVAILABLE AT AN EXTRA COST.
3. ELECTRICAL CONNECTION: 0.875" (22) HOLE 115 V, 1 PH, 60 HZ, 5 AMPS
4. GAS CONNECTION: 1/2" NPT.
5. ELECTRIC POWER NOT REQUIRED ON OPTIONAL STANDING PILOT MODELS (HFP/2)

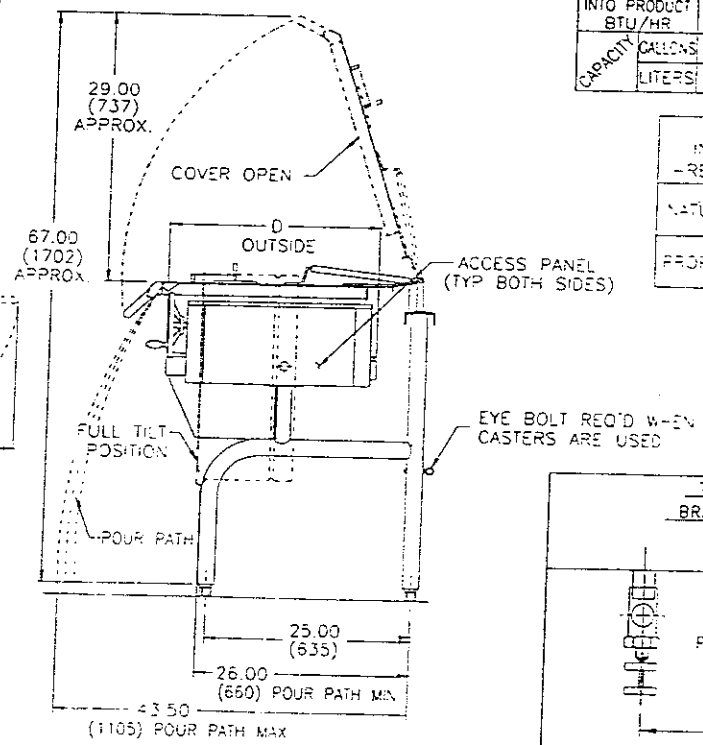
| TABLE OF DIMENSIONS | | | | | | |
|---|---|---|---|---|---|---|
| MODEL | HFP/2-2 | | HFP/2-3 | | HFP/2-4 | |
| DIMS. | INCH | MM | INCH | MM | INCH | MM |
| A | 25.375 | 645 | 31.25 | 794 | 42.375 | 1076 |
| B | 31.00 | 787 | 37.375 | 949 | 48.00 | 1219 |
| C | 41.625 | 1057 | 48.375 | 1229 | 58.00 | 1473 |
| D | 26.00 | 660 | 26.00 | 660 | 26.00 | 660 |
| E | 7.00 | 178 | 10.00 | 254 | 15.00 | 381 |

| PERFORMANCE DATA | | | | |
|---|---|---|---|---|
| MODEL | | HFP/2-2 | HFP/2-3 | HFP/2-4 |
| FIRING RATE BTU/HR | | 80,000 | 104,000 | 144,000 |
| HEAT RATE INTO PRODUCT BTU/HR | | 52,000 | 67,600 | 93,600 |
| CAPACITY | GALLONS | 23 | 30 | 40 |
| | LITERS | 87 | 114 | 152 |

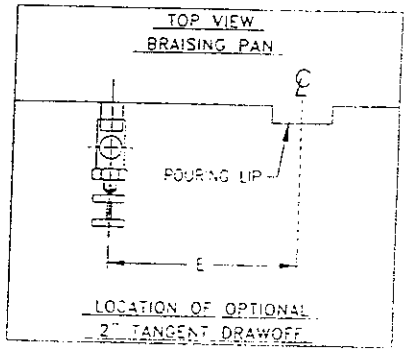
| GAS FEED RATE: INCHES WATER COLUMN -RECOMMENDED INCOMING- | |
|---|---|
| NATURAL GAS | 4.5" W.C. MIN<br>14" W.C. MAX |
| PROPANE GAS | 11" W.C. MIN<br>14" W.C. MAX. |




FRONT VIEW




RIGHT SIDE VIEW




P/N 127755 REV. A

NSF

DESIGN AMERICAN GAS ASSOCIATION CERTIFIED

APPROVED

MADE IN USA

Revised 9/99

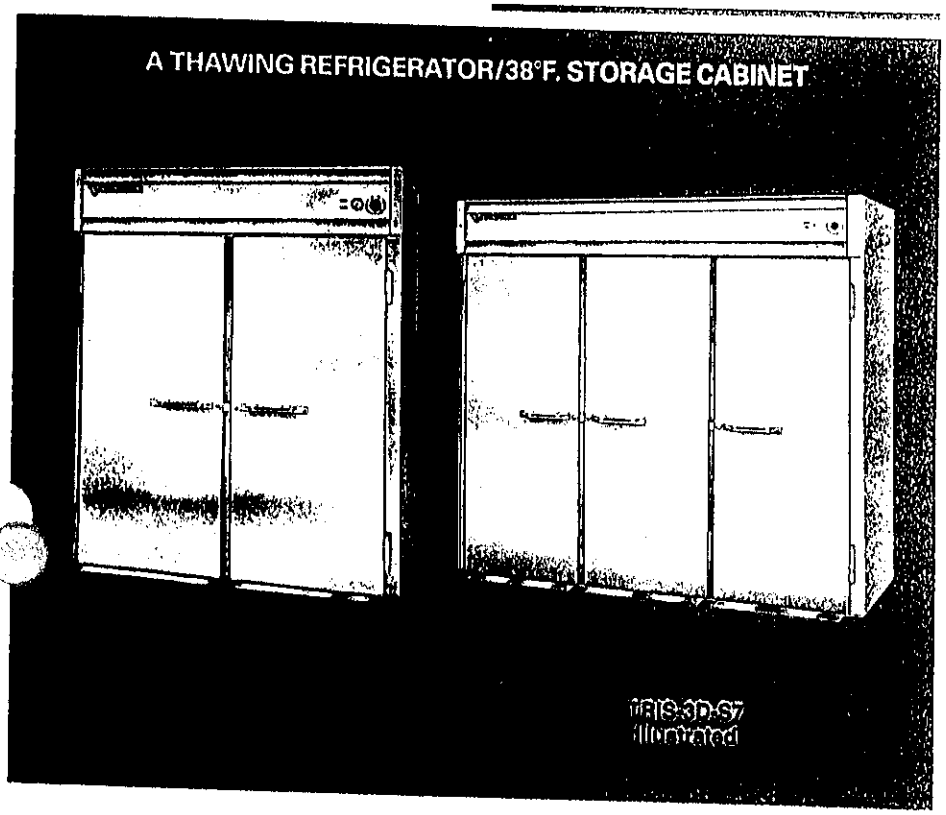
15Ev

Job ..... Item # 29

# Rapid Thaw® Roll-In Thawing Cabinets

**TRIS MODELS —**
Stainless steel exterior and interior.

TRIS-2D-S7
~~TRIS-3D-S7~~




## Standard Features

- Two Operational Features
  - Thaw processing Refrigerator
  - 38°F. Storage Freezer
- Operational Indicator Panel with
  - Visual Alarm System
  - Temperature Sensing Dial
  - Power Indicator Light
  - Thaw Timer
- Stainless Steel Case Front and Door(s)
- Heavy Duty Cam Lift Hinges
- Safety Grip Handle(s)
- Self Closing Doors with Safety Stops
- Energy Saving Thermal Breaker Strips
- Heavy Duty Cylinder Locks
- One Piece Self-Adjusting Magnetic Door Gaskets
- High Impact ABS Interior Door Liner
- Plasticized Fin Coil
- Condensate Automatically Evaporated
- Energy Efficient Refrigeration System

## Optional Features and Accessories

- Change Door Swings
- Stainless Steel Case Back
- Remote and Pass-Thru Models Available

**Cabinet:**
The cabinet front and doors are constructed of heavy gauge polished stainless steel to maintain an attractive appearance after years of heavy use. Foamed-in-place polyurethane insulation throughout the cabinet and doors ensures the ultimate in energy efficiency.

**Doors:**
Each self-closing door has rugged cam-lift hinges, a heavy duty cylinder lock and a self-adjusting magnetic gasket to prevent the cold air from escaping. Humidity control wires located around the door jamb prevent condensation from forming on the cabinet front and are concealed by a high impact, non-conductive thermal breaker strip. The interior door liner is constructed of durable ABS material.

**Refrigeration System:**
The air circulating fans and plasticized, finned, forced convection coil are contained within a top mounted housing. During the thaw cycle, this system uses high velocity convected air and a patented system of alternating cycles of heating and refrigeration. Auxiliary fans with safety grilles, located in a center mullion, are automatically activated at the start of the thawing cycle. During the thaw cycle, air temperature never exceeds 43°F. Upon completion of the cycle, the fans stop automatically, converting the cabinet to a storage refrigerator. The refrigeration system has sufficient capacity to maintain cabinet temperatures of +38°F. to +40°F. when operating in an ambient temperature of +100°F. All condensate water is removed by a vaporizer located in the top of the cabinet.

Victory Refrigeration
110 Woodcrest Road
Cherry Hill, NJ 08003-3648 U.S.A.
PH: (856) 428-4200 FAX: (856) 428-7299
Website: www.victory-refrig.com
E-Mail: sales@victory-refrig.com

# VICTORY Rapid Thaw® Roll-In Thawing Cabinets

**CHARACTERISTICS**

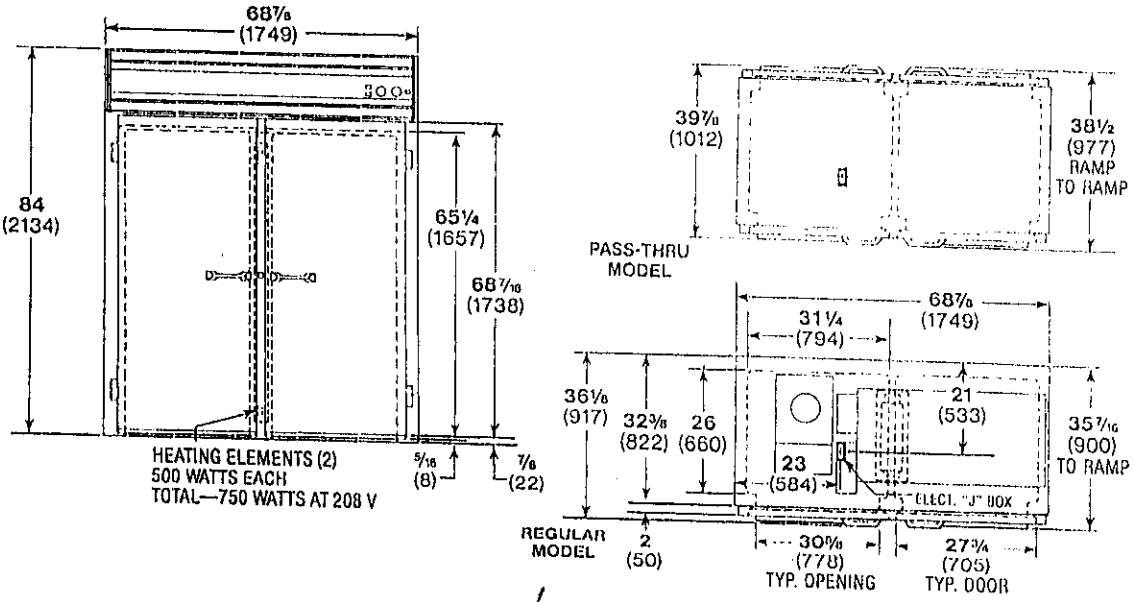
| | TWO SECTION | | THREE SECTION | |
|---|---|---|---|---|
| | Reach-In | Pass-Thru | Reach-in | Pass-Thru |
| Width, Overall | 68 7/8 | 68 7/8 | 101 1/4 | 101 1/4 |
| Depth, Overall (incl. handles) | 36 1/8 | 39 7/8 | 36 1/8 | 39 7/8 |
| Height, Overall | 84 | 84 | 84 | 84 |
| Depth, Door Open 90° | 65 1/4 | 98 1/8 | 65 1/4 | 98 1/8 |
| Clear Full Door Opening, Height/Width | 65 1/4 x 27 3/4 | 65 1/4 x 27 3/4 | 65 1/4 x 27 3/4 | 65 1/4 x 27 3/4 |
| Depth, Case over ramps | 35 7/16 | 38 1/2 | 35 7/16 | 38 1/2 |
| Capacity Net (cubic feet) | 64.3 | 69.5 | 95.1 | 102.8 |
| No. of Full Doors | 2 | 4 | 3 | 6 |
| Cabinet Voltage | 115/60/1 | 115/60/1 | 115/60/1 | 115/60/1 |
| Condensing Unit Voltage | 115/60/1 | 208/60/1 | 208/60/1 | 208/60/1 |
| Condensing Unit Size (HP) | 1/2 | 3/4 | 3/4 | 1 |
| Thaw Circuit Voltage | 208/60/1 | 208/60/1 | 208/60/1 | 208/60/1 |
| Max. Fuse Size T.D. | 30 Amps | 25 Amps | 30 Amps | 30 Amps |
| Min. Circuit Amps | 22.7 | 20.4 | 23.6 | 25.4 |

Electric Feed Wires: 3 wire with neutral—115/208/60/1

| CRATED DIM. & WTS. | Ht. | Width | Depth | Cu.Ft. | S/S |
|---|---|---|---|---|---|
| One Section | 87 | 74⅝ | 44¾ | 168.1 | 1010 |
| Two Section | 87 | 107 | 44¾ | 241.1 | 15[illegible] |

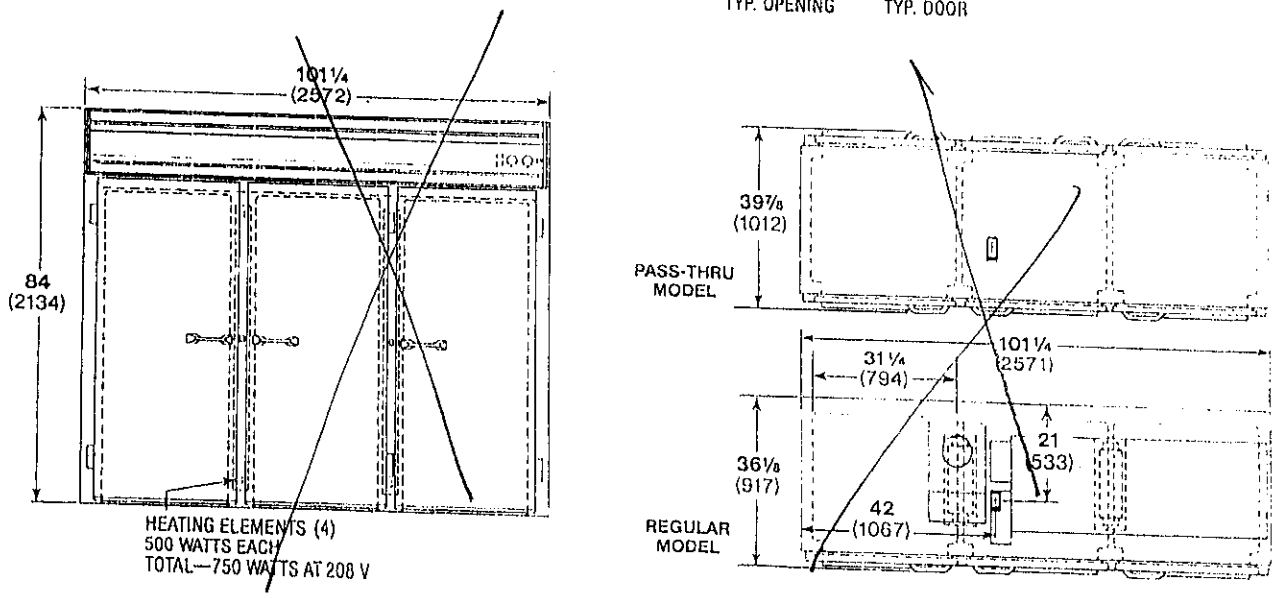
Cabinets can be modified for remote installation and use of water cooled condensing units. Consult factory for installation requirements

Dimensional tolerance ± ¼" Metric dimensions (MM)




*NOTE: If cabinet is located directly against wall and/or under low ceiling, a minimum clearance of 2" is required.*

*We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.*



CRES COR®

JOB: _____

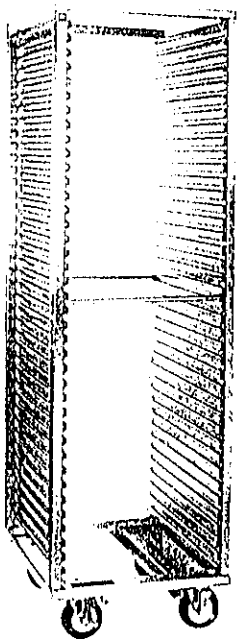
ITEM NO: #29

# CORRUGATED SIDEWALL ROLL-IN REFRIGERATOR RACKS 208 SERIES

## (FOR 18" X 26" PANS)

### FEATURES AND BENEFITS:

- Durable rack specifically designed to fit roll-in or pass through refrigerators, freezers, and warming cabinets; eliminates unnecessary product handling while maintaining proper temperature levels. Holds 18" x 26" pans.
- Fully welded framework of structural aluminum extrusions for rigidity and durability.
- Constructed of non-corrosive, Hi-Tensile aluminum for strength.
- Corrugated sidewalls securely hold 18" x 26" pans on 1-1/2" centers without tipping. Provides added strength.
- Inboard heavy duty 5" swivel casters, two with brakes. Wheel placement permits easy "in-and-out" of roll-ins.
- Two styles available; Custom (C) or Deluxe (D). Deluxe includes perimeter bumper and enclosed base.



208-1835-C

NSF

ACCESSORIES and OPTIONS
(Available at extra cost):

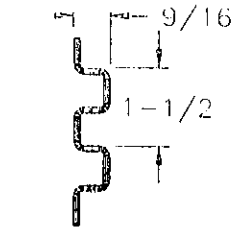
- ❑ Pan Stop
- ❑ Corner Bumpers
- ❑ Vertical Bumpers
- ❑ Various Caster Options

See page G-36 for accessory details.

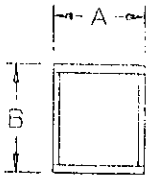
CRES COR®

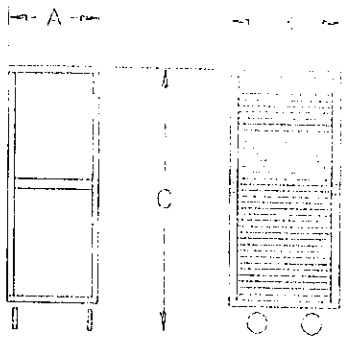
5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com

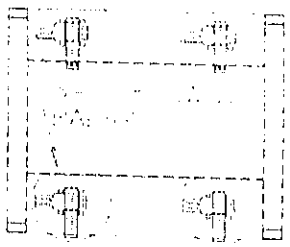
# 208 Roll-In Series (18" x 26" pans)




DETAIL OF PAN SLIDE



## CUSTOM ("C")

| CRES-COR MODEL NO. | PAN CAP | PAN SIZE | | DIM "A" WIDTH | DIM "B" DEPTH | DIM "C" HEIGHT | INSIDE DIMENSIONS WIDTH | INSIDE DIMENSIONS DEPTH | INSIDE DIMENSIONS HEIGHT | | WEIGHT ACT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 208-1835-C | 35 | 18 x 26 | IN | 20-11/16 | 25-1/8 | 64-1/2 | 18-1/8 | 24-3/8 | 55-15/16 | LBS | 65 |
| | | 45.7 x 66.0 | CM | 52.5 | 63.8 | 163.8 | 46.0 | 61.9 | 142.1 | KG | 29 |

## DELUXE ("D")

| CRES-COR MODEL NO. | PAN CAP | PAN SIZE | | DIM "A" WIDTH | DIM "B" DEPTH | DIM "C" HEIGHT | INSIDE DIMENSIONS WIDTH | INSIDE DIMENSIONS DEPTH | INSIDE DIMENSIONS HEIGHT | | WEIGHT ACT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 208-1835-D | 35 | 18 x 26 | IN | 22-9/16 | 27 | 64-1/2 | 18-1/8 | 24-3/8 | 55-15/16 | LBS | 70 |
| | | 45.7 x 66.0 | CM | 57.3 | 68.6 | 163.8 | 46.0 | 61.9 | 142.1 | KG | 32 |

NOTE: Send sample pan or tray with order when using any that are not 18" x 26" pans with heavy beaded edges.

ALL ALUMINUM CONSTRUCTION IS RIVETED, WELDED AND FINISHED.

**RACK:**
- Posts: Extruded channels, 1-1/16 x 2 x .125.
- Top and bottom: Extruded channels, 1-1/16 x 2-3/8 x .188; welded to posts.
- Tie rods (2): 5/16 dia. steel rods enclosed in aluminum tubing; fastened to posts.
- Sides: .063 aluminum corrugations riveted to posts.
- Bolsters: Formed .190 aluminum; welded to posts, casters attached.
- Casters: 5" dia., swivel, neoprene tires, 1-1/4 wide, load cap. 200 lbs. each, temp. range -20°/+160°F. Bearings are sealed and permanently lubricated. Two casters equipped with brakes.

**DELUXE ("D") MODELS:**
- Base plate: One piece .063 aluminum.
- Bumper: 1" wide gray rubber, perimeter type.

**PAN SLIDES:**
- Corrugations act as pan slides on 1-1/2" centers.

### SHORT FORM SPECIFICATIONS

Cres-Cor Roll-In Refrigerator Rack Model 208-1835- (C) or (D). Extruded aluminum welded construction. Tie rods (2) applied at front and rear. No-tip corrugated sides for (35) 18" x 26" pans on 1-1/2" centers. Inboard 5" swivel neoprene casters, permanently lubricated, sealed ball bearings. Load capacity 200 lbs. each, temperature -20° to +160°F.

❑ Custom Model (C)
❑ Deluxe Model (D) has .063 aluminum base plate; perimeter bumper.

Provide the following accessories: _____ _____ _____.
NSF listed. 2 year parts warranty.

CRES COR®

5925 Heisley Road • Mentor, OH 44060-1833
Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com
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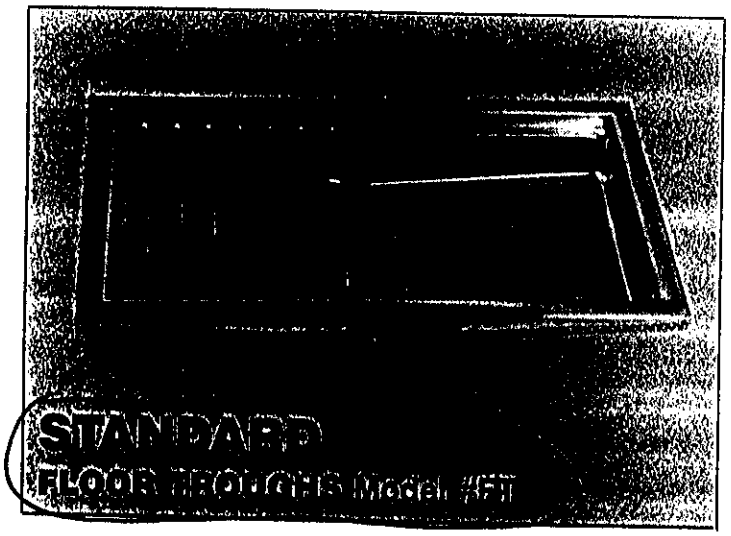
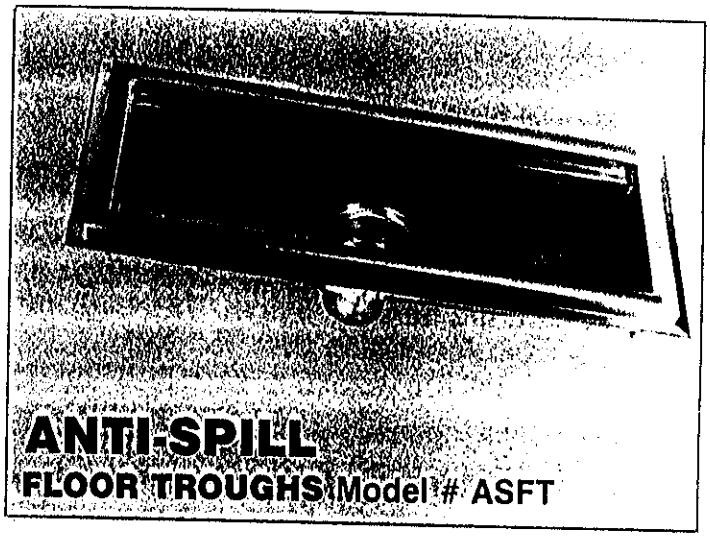
*In line with its policy to continually improve its products, CRES-COR reserves the right to change materials and specifications without notice.*

Litho in U.S.A.

ITEM #30

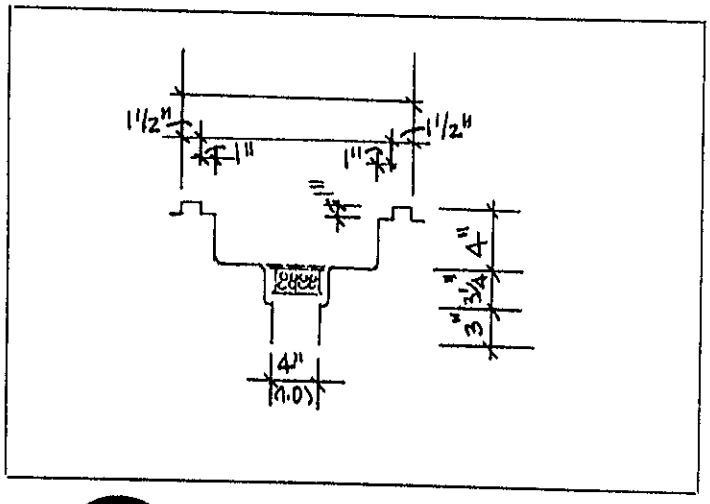
# STANDARD DEPTH FLOOR TROUGHS

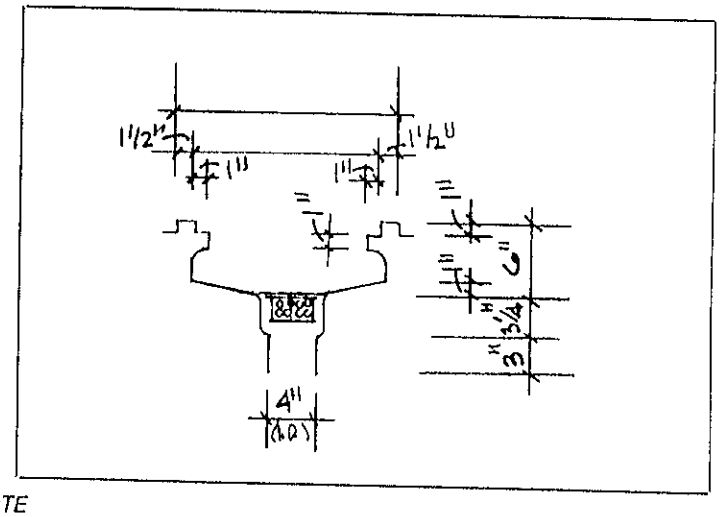



## CONSTRUCTION

All floor troughs are constructed of heavy duty 14 gauge stainless steel type 304- 18-8, completely welded and coved. All welds are ground & polished smooth. Troughs have built-in pitch towards wastes for complete drainage and anchor straps for securing. All troughs are fitted with special stainless steel waste cup with removable perforated stainless steel basket to accommodate up to 3" waste pipe. Advise size and location of waste outlet.




*NOTE*

*For troughs less than 15" wide 1½" top edge will become ¾";*


FOOD SERVICE CORP.

1-800-221-5644

POST OFFICE BOX 206 • COPIAGUE, NEW YORK 11726 • 516-789-8881

•OFFICE AND SHOWROOM, 310 MARCONI BLVD • FAX: 516-789-3633

# GRATING FOR STANDARD TROUGHS

## SUBWAY GRATING /Model #SG

(All Type 304 Stainless Steel)

Grating to be constructed of 3/16″ x 1″ bars, set in a vertical position with open front and back for ease of draining.

Two (2) 1/2″ rods, set 3″ in from each edge, are wedged thru the bars full length. Three (3) 1/2″ rods are used for grating over 15″ wide.

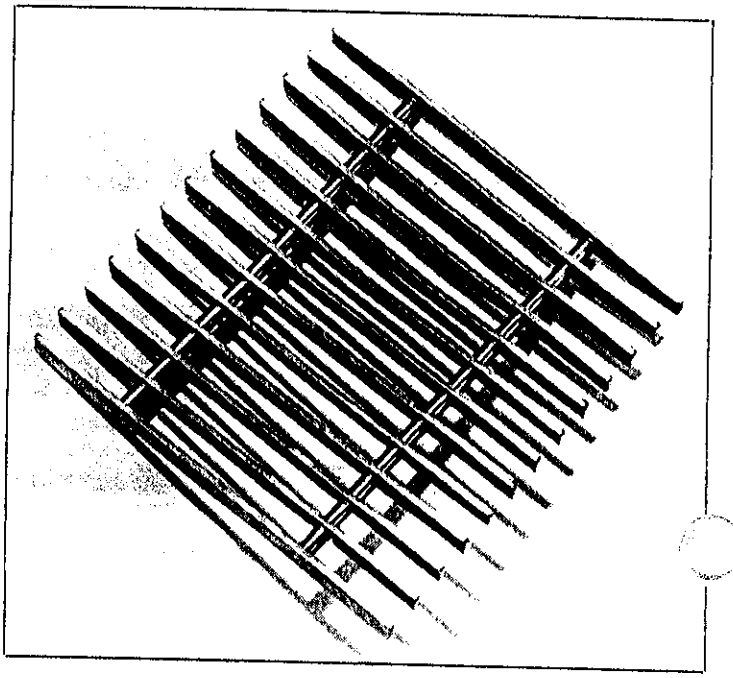
Rods are Heli Arc welded to each 3/16″ bar for rigidity thereby eliminating swaying and crevices.

There is 13/16″ clearance between bars so that wheels of mobile equipment will not become wedged.

Length of gratings are kept at maximum of 20″, for ease of handling and for cleaning in dishwasher.

(Longer lengths available upon request.)

(Bars can be had at any desired centers, specify)



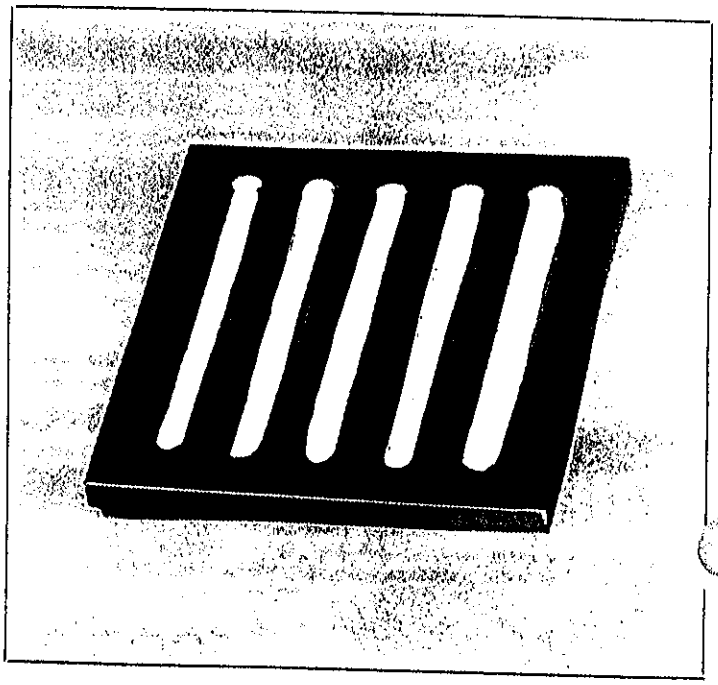
## LOUVERED GRATING /Model #FG

Grating to be fabricated of 14 gauge 18-8 type 304 stainless steel.

Gratings are 1″ thick and have die formed louvers, one piece design with a #3 polished finish.

They are fabricated in approximately 20″ lengths and are easily removed for cleaning in dishwasher.

(Longer lengths available upon request.)



Delfield

Project _____

Item Number #31

Quantity _____ Date _____

Approval _____

# SRPT-SS/SFPT-SS

## Supremacy Series™ Solid Door Pass-Through Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units are mounted on 4" (10.16 cm) casters.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon insulated double pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

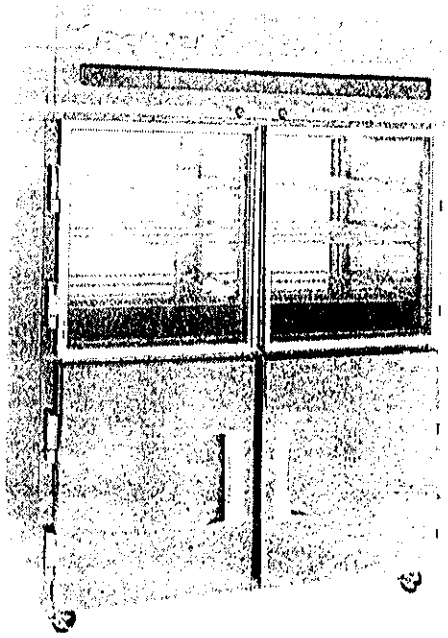
Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34ºF to 40ºF (1ºC to 4ºC) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain –10ºF to 0ºF (-23ºC to -18ºC) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.



**MODEL SRPT2-GHSH**

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray Slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 6" (15.24 cm) diameter legs (adds 2" to over height of unit)

c UL NSF UL 404A

The Delfield Company, P.O. Box 470, Mt. Pleasant, MI 48804-0470, U.S. A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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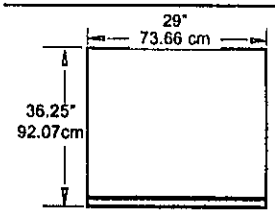
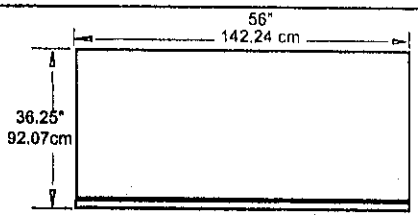
Delfield

# SRPT-SS/SFPT-SS

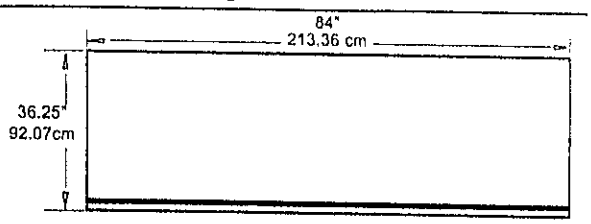
## Supremacy Series™ Solid Door Pass-Through Refrigerators and Freezers



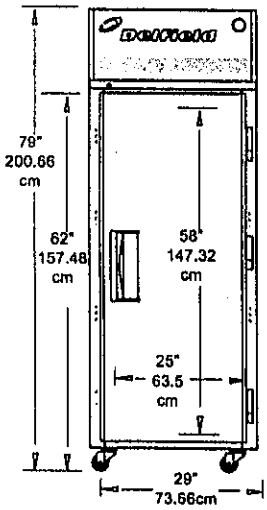

PLAN VIEW



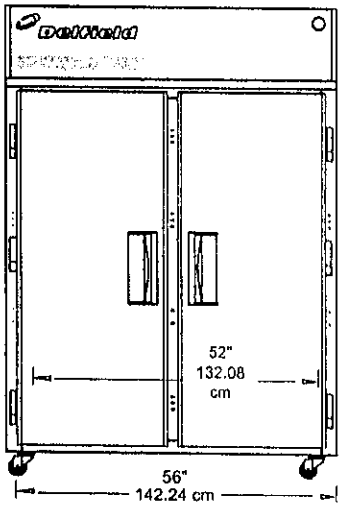

PLAN VIEW



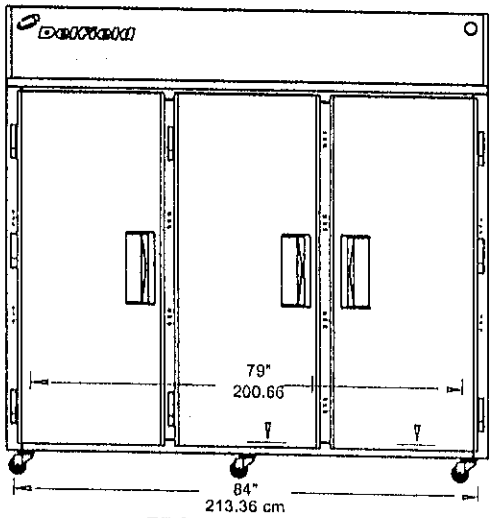

PLAN VIEW



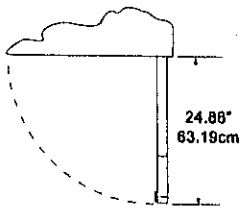

FRONT ELEVATION



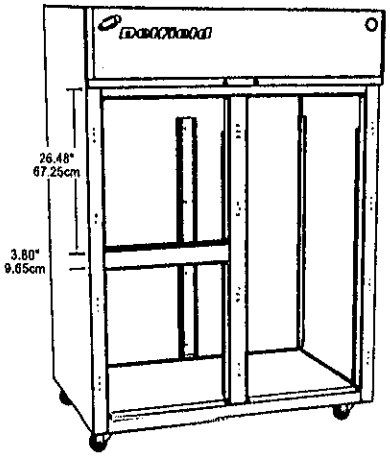

FRONT ELEVATION

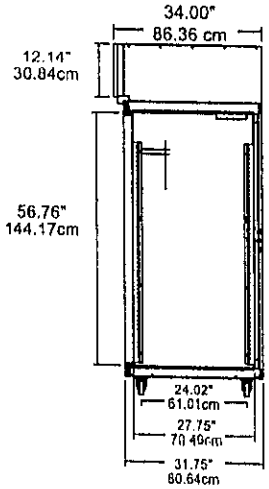



FRONT ELEVATION




DOOR CLEARANCE DETAIL




## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTU/HR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| **REFRIGERATORS** | | | | | | | | | | |
| SRPT1-S(S) | 115 | 10.5 | 26.64 | 12.87 | 1 | 1/3 | 968 | 2354 | 632 | 5-15P |
| SRPT2-S(S) | 115 | 12.5 | 56.72 | 27.5 | 2 | 1/2 | 1843 | 3637 | 961 | 5-15P |
| SRPT3-S(S) | 208-230 | 14 | 84.19 | 40.5 | 3 | 3/4 | 2698 | 6744 | 1228 | 14-20P |
| **FREEZERS** | | | | | | | | | | |
| SFPT1-S(S) | 115 | 12 | 26.64 | 12.87 | 3 | 1/2 | 1583 | 2467 | 672 | 5-20P |
| SFPT2-S(S) | 208-230 | 16 | 56.72 | 27.5 | 6 | 1 | 3013 | 3497 | 1001 | 14-20P |
| SFPT3-S(S) | 208-230 | 16 | 84.19 | 40.5 | 9 | 1 1/2 | 4412 | 5185 | 1268 | 14-20 |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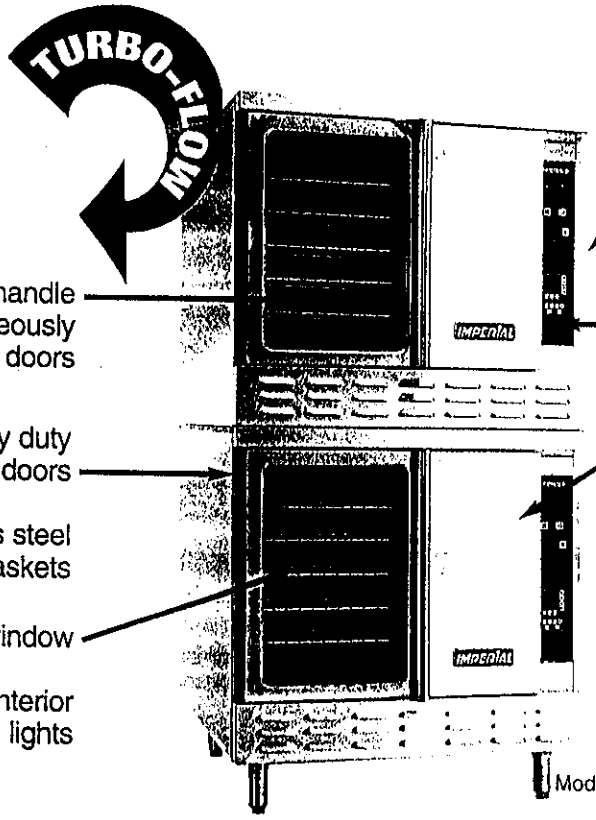
DSSPT 09/01

IMPERIAL

Item # #32

# Turbo-Flow Convection Ovens

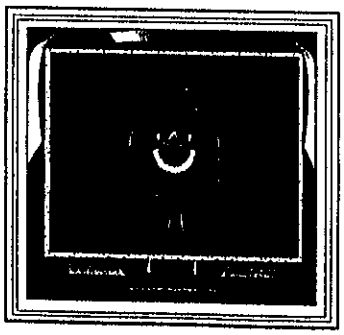
## Single and Double Deck Models




Model # ICV-2

### Turbo-Flow Standard Features

- Stainless steel exterior: doors, sides, legs and top.
- Large window and two interior lights for easy viewing of products being cooked.
- Single handle simultaneously opens both doors.
- Heavy duty 60/40 stainless steel doors.
- Rugged 1/2 h.p. – two speed motor for high volume or delicate baking.
- 70,000 BTU oven – Standard depth (ICV) and 80,000 BTU oven – Bakery depth (ICVD) for high production cooking and fast recovery.
- Model ICV-1 includes stainless steel legs as standard. Stainless steel shelf and adjustable rack supports are optional.
- One year parts and labor warranty.
- AGA and CGA design certified, NSF and CE listed.



Turbo-Flow System

### Turbo-Flow Convection Ovens

The Turbo-Flow offers commercial kitchens a reliable full featured convection oven that raises the industry standard.

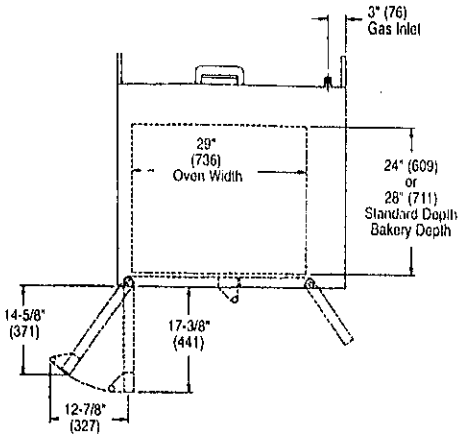
Imperial's Turbo-Flow System provides even cooking throughout the entire 70,000 BTU oven by recirculating hot air to maximize efficiency. It creates an air flow pattern that simultaneously heats the inner and outer oven cavity. This results in efficient, even heating and fast recovery. The oven features 60/40 doors that are mechanically driven to allow complete easy access to the interior. They swing open to 130° permitting a workable loading area around the oven.

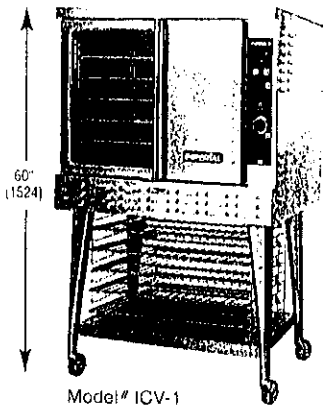
The spacious porcelainized interior has two lights with a momentary switch outside of the oven for easy product viewing through the large window. Imperial provides five chrome racks that can be placed into 12 positions allowing maximum loads within the oven.

Two speed fan, 1/2 h.p. motor and 60 minute timer give the operator the flexibility to cook many different types of casseroles, pastries, meats, breads and desserts. Available with optional Cook and Hold computer control.

NSF

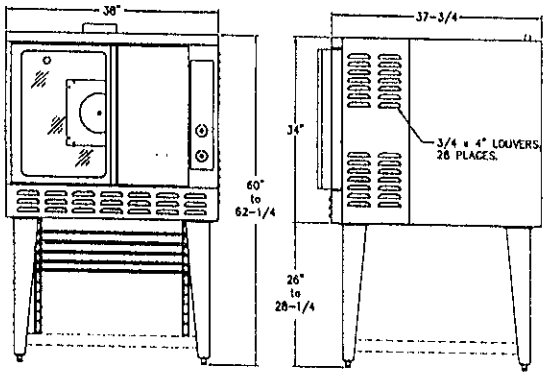
# Turbo-Flow Convection Ovens



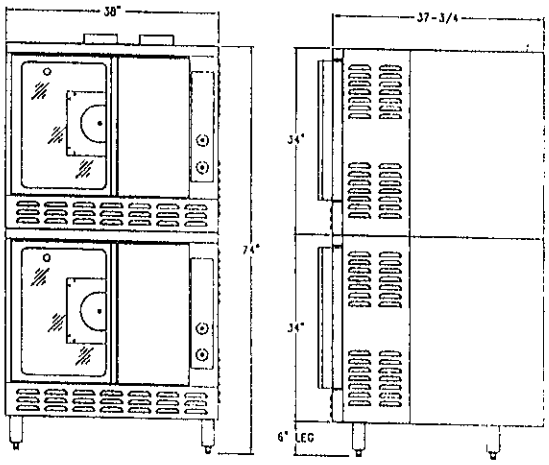

Single Deck Convection Oven shown with optional storage racks and shelf.

Model# ICV-1




Optional Bottom Shelf

Single Deck ICV-1




Double Deck ICV-2

## Turbo-Flow Convection Ovens

| Model # | Description | Overall Dimensions Width | Height | Depth | Total B.T.U. | Ship Weight (Kg) | (Lbs) |
|---|---|---|---|---|---|---|---|
| ICV-1 | Single Deck, Standard depth | 38" | 60" | 40 1/4" | 70,000 | 236 | 521 |
| ICV-2 | Double Deck, Standard depth | 38" | 74" | 40 1/4" | 140,000 | 455 | 1005 |
| ICVD-1 | Single Deck, Bakery depth | 38" | 60" | 44 1/4" | 80,000 | 277 | 611 |
| ICVD-2 | Double Deck, Bakery depth | 38" | 74" | 44 1/4" | 160,000 | 536 | 1185 |

Note: For Cook and Hold computer control feature add the suffix "– H" for one oven or "– HH" if required for both ovens.

**Crated Dimensions:** Add 2" to width; 7" to depth; and 3" to oven cabinet height.

### Options

- Available in single or double deck models.
- Stainless steel stand with bottom shelf and adjustable rack supports.
- Draft hood with stainless steel finish.
- Heavy duty 6" swivel casters.
- Stacking kit with 6" stainless steel legs.
- Cook and Hold computer control.
- Standard and bakery depth.

### Gas Requirements

| | |
|---|---|
| Manifold pressure | 5.0" W.C. Natural Gas |
| | 10.0" W.C. Propane Gas |
| Manifold size | 3/4" NPT. |
| Input Rating | 70,000 BTU/hr. (per oven- ICV) |
| | 80,000 BTU/hr. (per oven- ICVD) |

### Electrical Requirements

120 VAC, 1ph, 60 Hz, 9 Amps Max. (per oven)
Two speed motor - 1/2 h.p., 1725/1140 RPM.
Optional 208/240 motor or transformer.

### Minimum Clearance

For use only on non-combustible floors with legs or casters; or 2 1/4" overhang is required when curb mounted.

0" clearance from non-combustible side and rear walls. Provide 6" minimum clearance from combustible side walls and 0" from combustible wall at rear.


IMPERIAL
Commercial Cooking Equipment
1560 Flower St., Duarte, CA 91010 Phone (626) 357-7411 FAX (626) 359-5909 E-Mail impsls@imperialrange.com Website imperialrange.com

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# SHORT SERIES™

GAS-FIRED STATIONARY
FULLY STEAM JACKETED
40, 60, GALLONS (150, 225 LITERS)

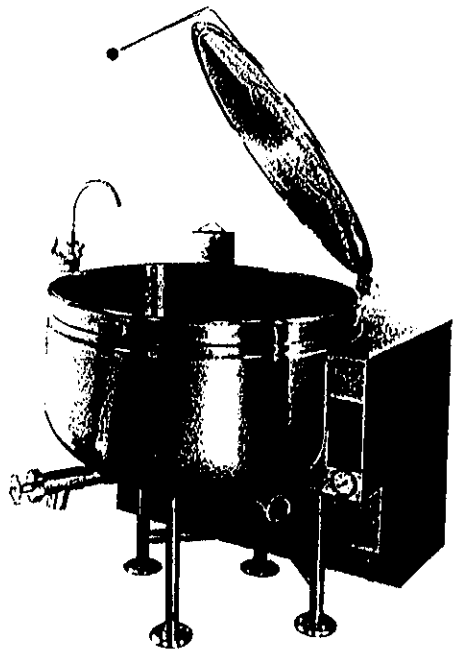
MODELS AVAILABLE
- [x] KGL-40SH
- [ ] KGL-60SH

ITEM NUMBER #36

JOB NAME / NUMBER _____

## Cleveland Standard Features

- High Efficiency (65%) Forced Air Double Pass Heating System
- Fast Heat-up and Recovery Time, 190M BTU on 40 and 60 gallons
- Automatic Hot-Surface Ignition System
- 50 psi Steam Jacket Rating and Safety Valve
- Splash-Proof Solid-State control panel
- Type 304 Stainless Steel with #4 finish on kettle and supports
- Steam Jacket permanently filled with treated distilled water
- Recessed, front-mounted Pressure/Vacuum Gauge
- Solid-State, precise temperature controls with less than 1° C. temperature difference
  - Control Panel Includes:
  - LED indicator for Heat Cycle
  - LED Indicator for Low Water
  - Power On/Off Switch
  - Adjustable Temperature Control Dial
- Spring-assisted, hinged, rotatable, domed Stainless Steel Cover
- 2" Tangent Draw-Off Valve
- Faucet Mounting Bracket (FBK)
- Standard for natural gas operation
- Standard voltage is 115 volt, 60 cycle, 1 phase, supplied with cord and plug
- Level adjustable flanged feet for floor bolting
- Approvals: NSF, AGA, CGA, CE Mark



Shown with optional Hot & Cold Water Faucet

## SHORT FORM SPECIFICATION

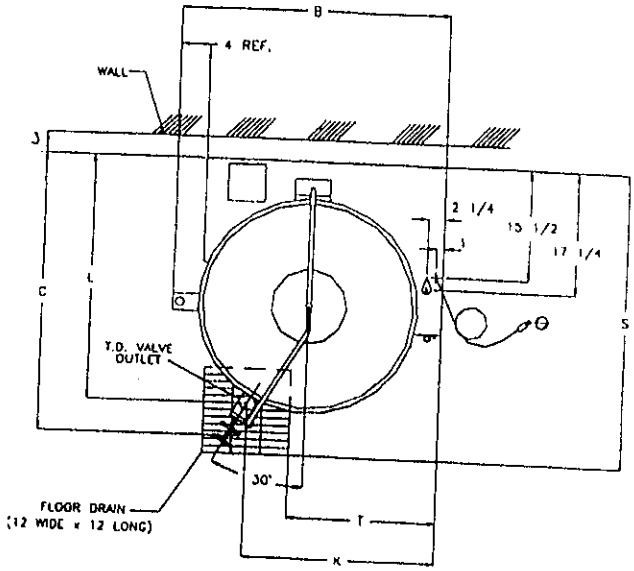
*Cleveland Gas-Fired Stationary Kettle, Model KGL-( )SH, 37.5" rim height, fully steam jacketed, 50 psi steam jacket rating, 190,000 BTU Double Pass Steam Generator, Power Burner System, Splash-Proof Solid-State Temperature Controls, Automatic Hot-Surface Ignition System*

## Options & Accessories

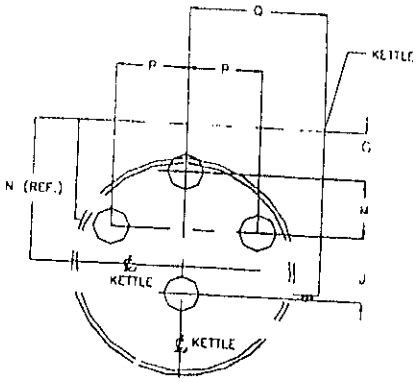
- [ ] 316 Stainless Steel Interior Liner (316G)
- [x] 3" Tangent Draw-off Valve (TD3)
- [ ] 3" Butterfly Valve (BV3)
- [x] Hot & Cold Water Faucet (DPK)
- [ ] Pan Carriers (PCK), Food Strainers (FS)
- [ ] Kettle Accessory Kit (KAK)
- [ ] Tri-Basket Strainer Support Systems (TBS)
- [ ] Kettles Markings (KM)
- [ ] Measuring Strips (MS)
- [ ] Food Strainers (FS)
- [ ] Propane Gas (PG)
- [ ] Correctional Packages



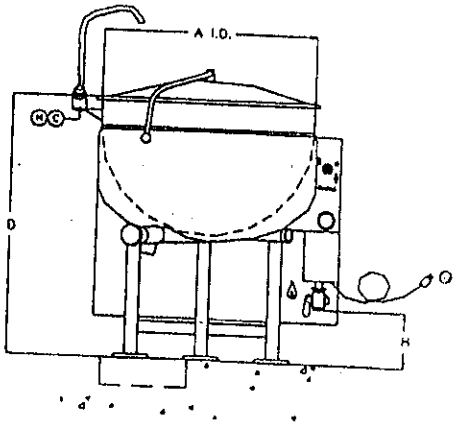
Cleveland Range Inc.
Ph: 1-216-481-4900 Fx: 1-216-481-3782
1333 East 179th St., Cleveland, Ohio, U.S.A. 44110
Visit our Web Site at www.clevelandrange.com



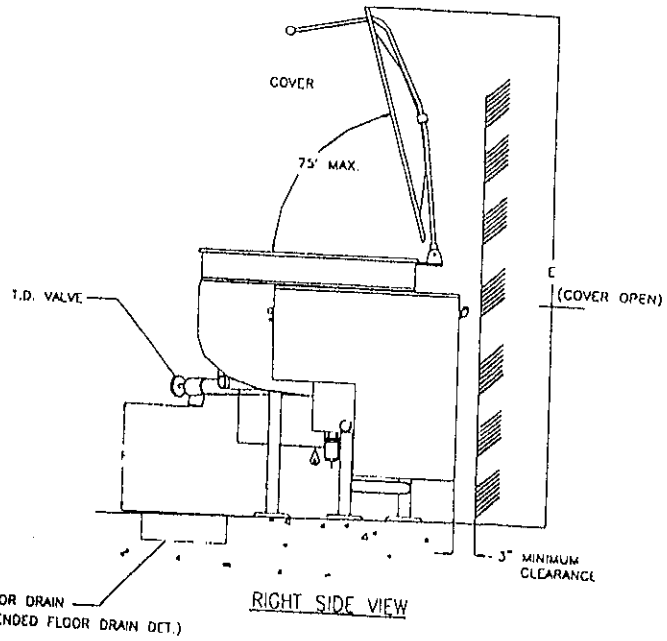

TOP VIEW




LEG LOCATIONS
(KETTLES WITH T.D. VALVE)




FRONT VIEW




RIGHT SIDE VIEW

| MODEL NO | | A | B | C | D | E | F | G | H | J | K | L | M | N | P | Q | S | T |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GL-40SH | IN | 33 | 41.6 | 43.3 | 37.5 | 69 | 15.5 | 7.3 | 6.7 | 11 | 28 | 35.5 | 8.2 | 21.6 | 11.5 | 20.8 | 43.5 | 23 |
| | mm | 838 | 1056 | 1099 | 953 | 1752 | 394 | 185 | 170 | 279 | 711 | 902 | 208 | 549 | 292 | 528 | 1105 | 584 |
| GL-60SH | IN | 33.5 | 44 | 43.5 | 37.5 | 71 | 12.1 | 7.3 | 5.5 | 12.6 | 30.5 | 35.5 | 8.2 | 22.2 | 13.7 | 22.1 | 44.5 | 24.5 |
| | mm | 850 | 1117 | 1104 | 953 | 1803 | 307 | 185 | 140 | 320 | 775 | 902 | 208 | 564 | 348 | 561 | 1130 | 622 |

| GAS | | | ELECTRIC | WATER | CLEARANCE |
|---|---|---|---|---|---|
| NATURAL | PROPANE | BTU RATING | | | |
| ping ¾" N.P.T.<br>pply pressure<br>.00" W.C. Min.<br>.00" W.C. Max. | Piping ¾" N.P.T.<br>Supply pressure<br>11.00" W.C. Min.<br>14.00" W.C. Max. | 190,000 | 120V-1Phase, 60 Hz.<br>10 amps | ½" diameter<br>Soft Copper<br>Tubing each<br>When ordered<br>with optional<br>faucet | RIGHT = 0"<br>LEFT = 0"<br>REAR = 0"<br>Allow 6" space min.<br>from rear and sides<br>When located near<br>combustible walls |

land Range reserves right of design improvement or modifications, as warranted.

Delfield

Project _____

Item Number #37

Quantity _____ Date _____

Approval _____

# SRR-S/SFR-S

## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units mounted on 4" (10.16) casters.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon-insulated double-pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain –10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, must be hard-wired to the junction box located on top of the unit.

MODEL SRR1-GHSH

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray Slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 6" (15.24 cm) diameter legs (adds 2" to over height of unit)

c UL NSF UL 404A

The Delfield Company, P.O. Box 470, Mt. Pleasant, MI 48804-0470, U.S. A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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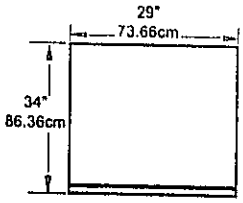
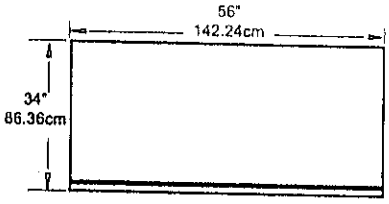
Delfield

# SRR-S/SFR-S

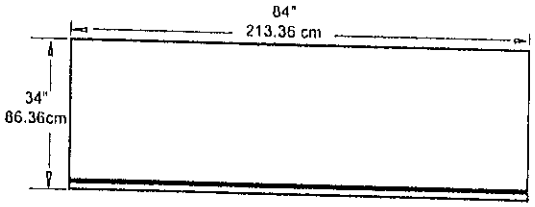
## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers



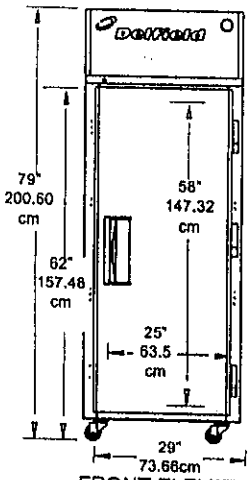

PLAN VIEW



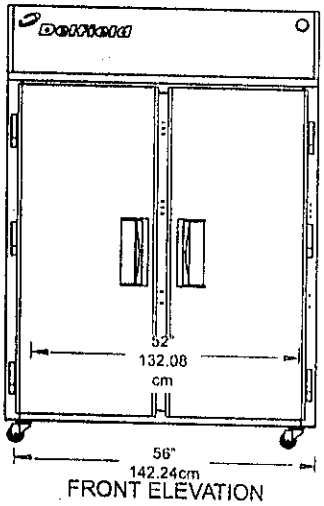

PLAN VIEW



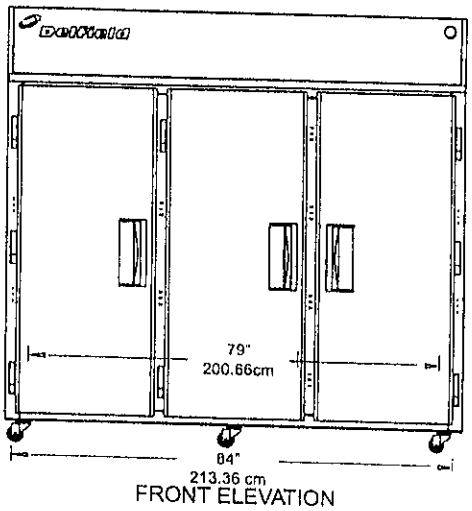

PLAN VIEW



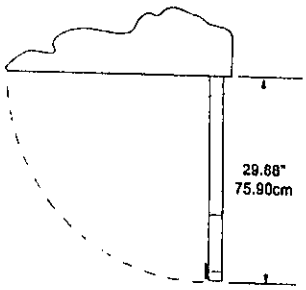

FRONT ELEVATION



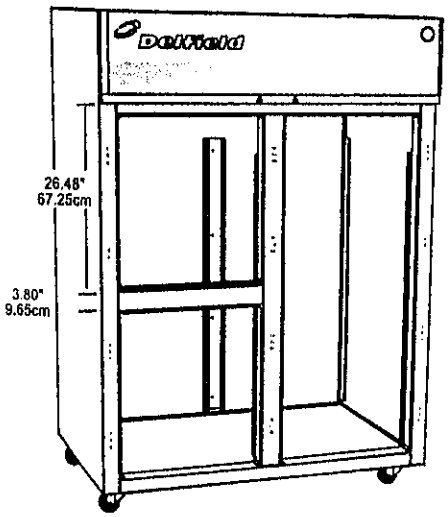

FRONT ELEVATION

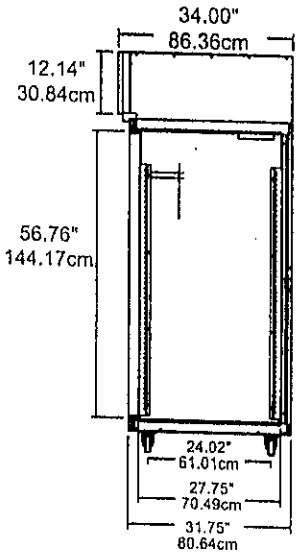



FRONT ELEVATION




DOOR CLEARANCE DETAIL




## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| **REFRIGERATORS** | | | | | | | | | | |
| SRR1-S | 115 | 8.5 | 24.96 | 12.87 | 1 | 1/4 | 758 | 2015 | 592 | 5-15P |
| SRR2-S | 115 | 10.8 | 51.92 | 27.5 | 2 | 1/3 | 1374 | 2943 | 856 | 5-15P |
| SRR3-S | 115 | 12.3 | 78.89 | 40.5 | 3 | 1/2 | 1971 | 3894 | 1088 | 5-20P |
| **FREEZERS** | | | | | | | | | | |
| SFR1-S | 115 | 11.1 | 24.96 | 12.87 | 3 | 1/2 | 1239 | 1629 | 650 | 5-20P |
| SFR2-S | 115 | 14.9 | 51.92 | 27.5 | 6 | 3/4 | 2247 | 3326 | 946 | 5-20P |
| SFR3-S | 115 | 16.0 | 78.89 | 40.5 | 9 | 1 | 3222 | 4253 | 1208 | 14-20P |

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DSSR 09/01

#38

## MODULAR BASE WITH KETTLE(S)

200M BTU GAS-FIRED STEAM GENERATOR
ONE or TWO, 6 GALLON KETTLE (S)
CABINET BASE:
24" (600mm) or 36" (900mm) WIDE
with Nickelguard

MODELS: ☐ ~~24-GM-K6-200~~
☐ ~~36-GM-K66-200~~
☒ 36-GM-K66-300

ITEM NUMBER _____

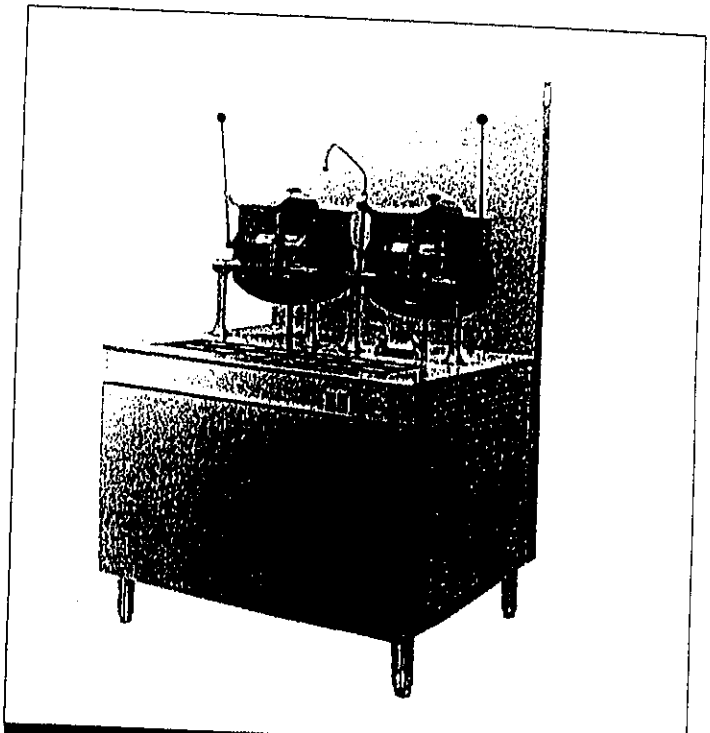
JOB NAME / NUMBER _____

### Cleveland Standard Features

- Factory assembled Kettle/Steam Generator NickelGuard Base combination with one or two,6 gallon kettles with 200M BTU Gas-Fired Steam Generator
- Solid State steam generator Water Level Controls
- Low Water Safety Cut-Off
- Pressure Limit Controls with 15 psi Safety Valve
- Type 430 Stainless Steel exterior enclosure, and table top (with Drain Trough which has 1.50" diameter male drain), #4 exterior finish
- Type 304 Stainless kettle(s), #4 exterior finish
- Separate "Start/Reset" Illuminated Switch Controls,plus Pressure Gauge
- Solid State Electronic Spark Ignition for energy savings
- Major components serviceable from the front of the unit
- 6 gallon kettle(s) are 2/3 Steam Jacketed and include Lift off Cover(s)
- Hot and Cold Water Faucet with Swing Spout
- Kettle(s) have 50 psi Steam Jacket Rating, 50 psi chrome plated Safety Valve(s) and Manual Tilting, balanced design
- Tilt Handles can be mounted on either side
- Steam Generator empties under pressure (blowdown) automatically upon each Shut-Down. Automatic Water Refill on Start-Up
- Standard voltage for controls is 115 volt, 60 Hz, single phase
- Adjustable Flanged Feet (FF-A)

### Options & Accessories

- ☐ Power Take-Off Kit (GPTO)
- ☒ Secondary Low Water Cut-Off, factory installed (CALG) (Required for AZ. AR. CA. CO. CT. DE. FL. GA. HI. IL. IA. KS. MD. MA. MI. MN. MT. NE. NV. NM. NC. OK. OR. PR. RI. TN. UT. VA. WA. WV., Buffalo, NY, Wash. DC)
- ☐ Gas, other than natural
- ☒ Type 316 Stainless Steel kettle interior for high acid food products (316)
- ☐ Food Strainers (FS)
- ☒ Stainless Steel Base Frame (FSS)
- ☐ 300,000 BTU Gas-Fired Boiler with Nickelguard
- ☐ Boiler Descaling Pump Kit (107142)



### SHORT FORM SPECIFICATION

*Shall be CLEVELAND, Modular Cabinet Base with one or two, 6 gallon kettle(s), Model ____ GM-K ____ -200, 200M Nickelguard BTU Gas-Fired Steam Generator, type 430 Stainless Steel exterior enclosure, Table Top, Back Splash and 4 level adjustable feet. 2/3 Steam Jacketed type 304 Stainless Steel kettle(s) with 50 psi Steam Jacket Rating; needle type Steam Control Valve on each kettle. Console mounted Controls, Pressure Gauge and Illuminated "Start/Reset" Control Switches. Solid State Water Level Steam Generator Controls and Electronic Spark Ignition. Steam Generator drains under pressure (blowdown) after each Shut-Down with Automatic Water Refill on Start-Up. 15 psi Safety Valve*



Cleveland Range Inc.
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1333 East 179th St., Cleveland, Ohio, U.S.A. 44110
Visit our Web Site at www.clevelandrange.com

- CAPACITIES: (in 4 oz. servings) (Other sizes may be calculated)

  6 gallons / 23 liters. . .160 per kettle

- Many local codes exist and it is the responsibility of the Owner and Installer to comply with those codes.

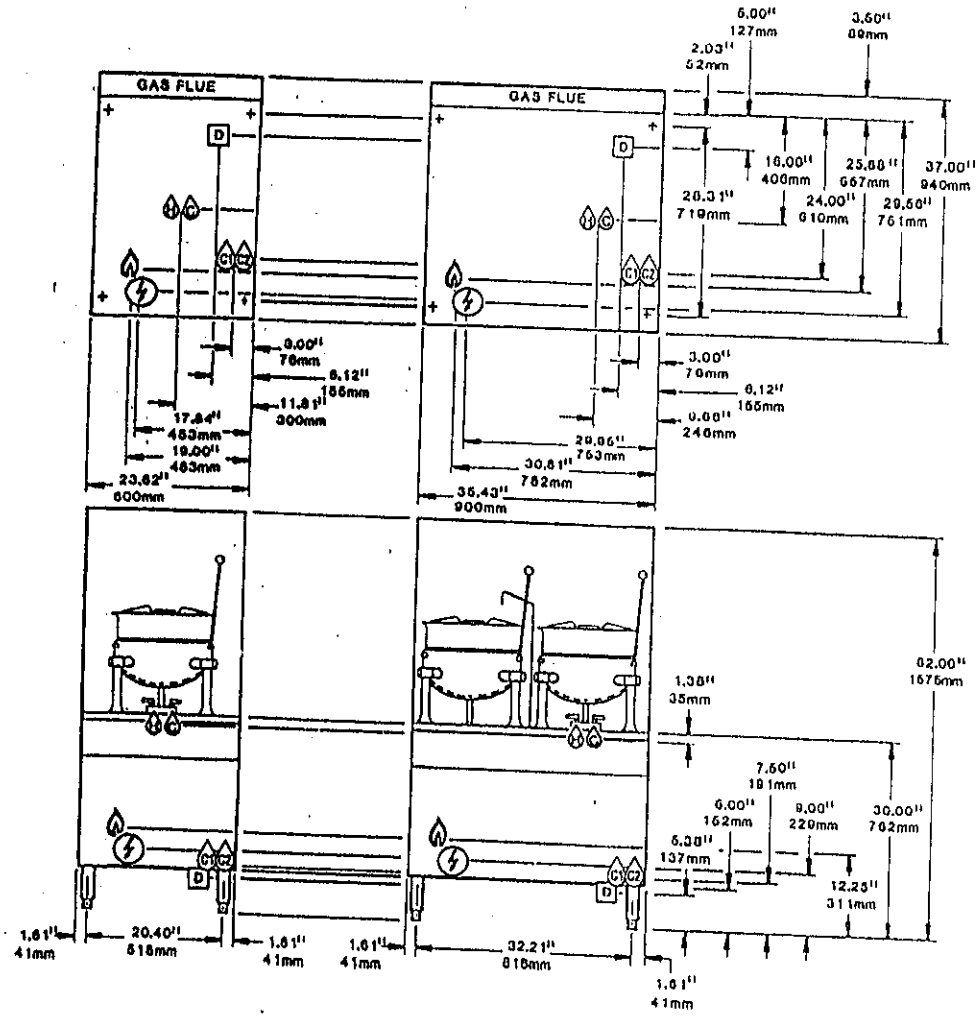
- Cleveland Range equipment is built to comply with applicable standards for manufacturers. Included among those approval agencies are: UL, A.G.A., NSF, ASME/N.Bd., CSA, CGA, ETL, and others.

## WATER QUALITY REQUIREMENT

The recommended minimum water quality standards whether untreated or pre treated, based upon 10 hours of use pe day, and a Daily Blowdown, are as follows:

| | |
|---|---|
| TOTAL DISSOLVED SOLIDS | less than 60 parts per million |
| TOTAL ALKALINITY | less than 20 parts per million |
| SILICA | less than 13 parts per million |
| CHLORIDE | less than 30 parts per million |
| pH FACTOR | greater than 7.5 |

Consult a local water treatment specialist for an on site water analysis for recommendations concerning steam generator feed water treatment (if required), in order to remove or reduce harmful concentrations of minerals. The use of highly mineralized water will mean that more frequent servicing of the steam generator will be necessary. The fact that a water supply is potable is not proof that it will be suitable for the generator.




| GAS | ELECTRIC | WATER | DRAINAGE | CLEARANCE |
|---|---|---|---|---|
| ¼" IPS for 220,000 BTU or less<br>Supply Pressure<br>NATURAL: " W.C. minimum, " W.C. maximum<br>PROPANE: 12.00" W.C. minimum, 14.00" W.C. maximum<br>urer must be notified if unit will be used above altitude. | 115V-1PH<br>25 watt Steam Generator control. | 35 psi minimum<br>60 psi maximum<br>H C ¾" IPS hot and cold water for kettles<br>¼" IPS cold water<br>C1 Condenser feed<br>C2 Boiler feed | 1½" IPS common drain.<br>Do not connect any other units to this drain.<br>The Floor Drain must be located outside the confines of the equipment base. | RIGHT = 0"<br>LEFT = 0"<br>REAR = 0"<br>For use only in non-combustible locations. |

Range reserves right of design improvements or modifications, as warranted.

SCALE .50" = 1'



0600
Litho In USA.

Project:

Prepared for: Item# 39

Date:

# VENTILATOR SYSTEMS

## *ENERGY AIRE* AUTO WASH

## WALL MOUNTED

Models
AWWO
AWWP
AWWI
AWWE
AWWD

AVTEC

### APPLICATION DATA

For use over all types of cooking equipment; unique grease extractor has auto wash and internal fire protection and extracts up to 95% of grease contaminants. Canopies are generally installed 6'-6" above finished floor. Stainless steel enclosure panels to the ceiling are available, or the hood may be recessed into the non-combustible false ceiling, depending on type of air make up - contact factory.

### SUPPLY AIR MAKE-UP

☐ TYPE " P" LOW VELOCITY FRONT DISCHARGE SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. Normally air is heated to 55°-65°F. Consult factory for specifics.

The perforated front panel slows the supply air velocity to lessen the effect of partially tempered outside air on conditioned room air. When lowest velocity is desired, the 30" high plenum [ventilator] is recommended.

☐ TYPE "I" INTEGRAL "SHORT CYCLE" SUPPLY

The integral "short cycle" supply air plenum may be used with up to 70% untempered air per U.L. testing. Some local codes limit this percentage or do not allow the "short cycle" concept. Normally, this type hood is used in warmer climates not susceptible to the colder, higher density winter air.

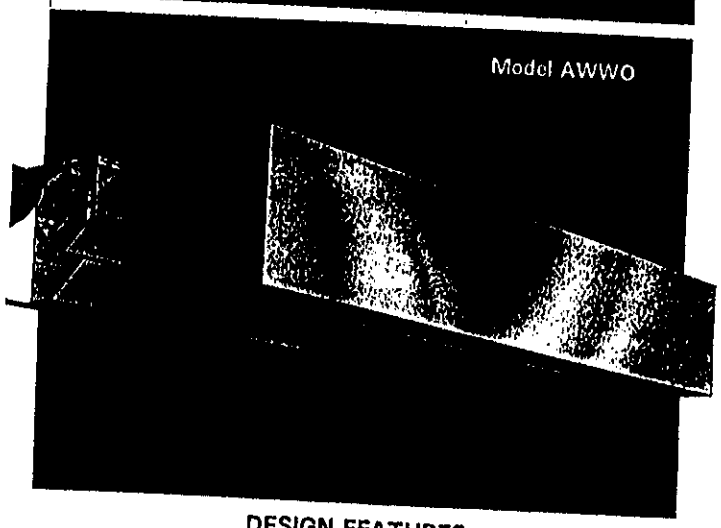
Integral untempered supply make-up air varies according to exhaust requirements, 20% recommended from adjacent areas to contain odors within the kitchen and remaining amount from ceiling registers located ideally 20 ft. from the hood. Consult factory for specifics.

☐ TYPE "E" EXTERNAL FRONT GRILL SUPPLY

Same air volumes as "P" type. Recommended for installations where finished ceiling is less than 9 ft. prohibiting effective use of "P" type [above]. The 4-way diffusers and internal balancing dampers allow precise directional control. Generally, air is conditioned to room temperature and directed just below the ceiling.

☐ TYPE "D" DUAL EXTERNAL AND INTERNAL SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. A combination of "I" and "E" type, allows for fine tuning of short cycle air supply. Varying climates may require incoming air to be conditioned to room temperature.




### DESIGN FEATURES

- U.L. Listed. Complies with all national codes.
- Auto wash and internal fire protection system.
- Unique extractors remove up to 95% of grease contaminants.
- Integral supply air balancing and fire damper.
- Electromechanical, resettable exhaust fire damper.

### OPTIONS AND ACCESSORIES

- U.L. Listed fusible link exhaust fire damper.
- Stainless Steel enclosure panels to ceiling.
- Auto Wash Control Panel with:
  - √ Fan and/or light switch
  - √ Fire System Interface
  - √ H.O.A. Fan Starter Interface
- Integral fire suppression system enclosure.
- Wet chemical fire suppression system.
- Water mist fire protection system with gas reset.
- Fan motor controller package
- Exhaust & supply fan package

### EXHAUST AIR RECOMMENDATIONS

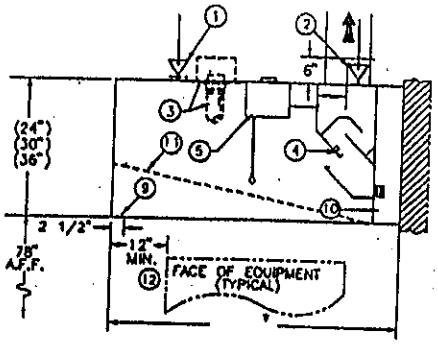
| TYPE EQUIPMENT | MIN. EXHAUST |
|---|---|
| Light Duty<br>Ovens, Steamers, Kettles [25 psig] | 200 cfm/lin. ft. |
| Medium Duty<br>Ranges, Griddles, Fryers, Fry Pans, Kettles [45 psig] | 250 cfm/lin. ft. |
| Heavy Duty<br>Hot Top Ranges, Upright Broilers, Electric Charbroilers | 300 cfm/lin. ft. |
| Extra Heavy Duty<br>Gas and Solid Fuel Charbroilers, Woks [water cooled], Kettles [100 psig] | Consult Factory |

The above figures are to be used as a guideline only. Since local field conditions vary greatly, we strongly suggest you consult the factory or your local AVTEC Representative.

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 [630] 851-4800

VENT. MODEL # AWW_ PROJECT:_____ ITEM# _____

## SECTION VIEWS

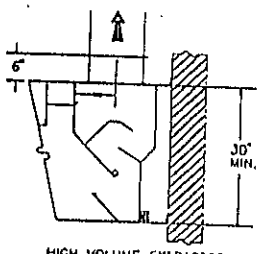



☐ AWWO

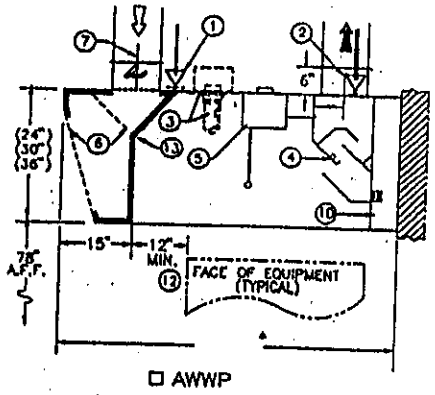
▼Recommended width: 51", 57", or 63"

LEGEND

1. Hanger brackets
2. U.L. Listed damper
3. U.L. Listed light fixture (globe) (recessed)(incandescent)(fluorescent)
4. Auto Wash Extractor
5. Damper recel housing
6. Supply air diffuser
7. Balancing damper
8. Fire damper
9. S/S gutter
10. 6" air space
11. 18" Front with tapered End Cap.
12. Recommended minimum overhang. Salamanders and Upright Broilers require 18".
13. Insulation–standard on type I and D.

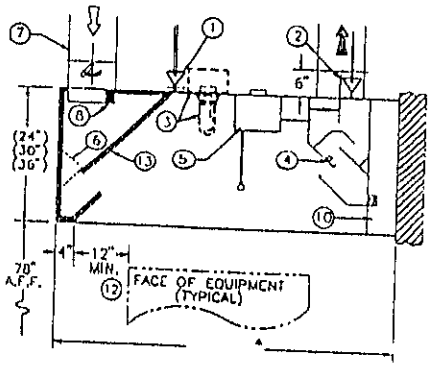



HIGH VOLUME EXTRACTOR ALLOWS LOWER STATIC PRESSURE AT 350 CFM/FT AND HIGHER.



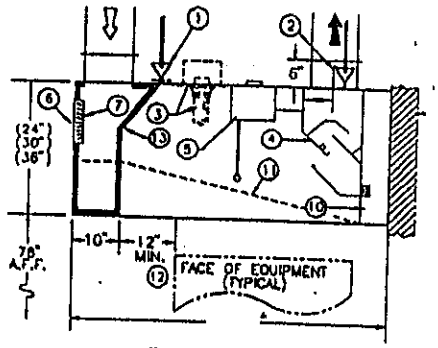

☐ AWWP

▼Recommended width: 66", 72", or 78"



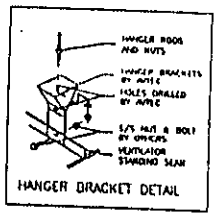

☐ AWWI

▼Recommended width: 55", 61", or 67"

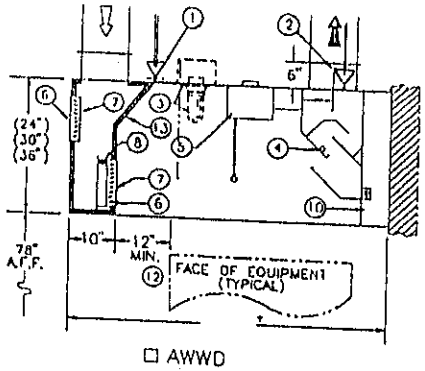



☐ AWWE

▼Recommended width: 61", 67", or 73"




HANGER BRACKET DETAIL




☐ AWWD

▼Recommended width: 61", 67", or 73"

## AIR FLOW CHART

| VENT LENGTH | 200 CFM/LINEAR FT (Light Duty) | | | | 260 CFM/LINEAR FT (Medium Duty) | | | | 300 CFM/LINEAR FT (Heavy Duty) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EXH. CFM 1.2"SP | EXH. DUCT COL. | SUP. CFM .25"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.3"SP | EXH. DUCT COL. | SUP. CFM .25"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.65"SP | EXH. DUCT COL. | SUP. CFM .25"SP | SUPPLY DUCT COLLAR |
| 3' | 600 | 10"x8" | 480 | 10"x10" | 750 | 10"x6" | 600 | 10"x10" | 900 | 10"x8" | 720 | 10"x10" |
| 4' | 800 | 10"x7" | 640 | 10"x10" | 1000 | 10"x8" | 800 | 10"x10" | 1200 | 10"x10" | 960 | 10"x16" |
| 5' | 1000 | 10"x8" | 800 | 10"x16" | 1250 | 10"x10" | 1000 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" |
| 6' | 1200 | 10"x10" | 960 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" | 1800 | 10"x16" | 1440 | 10"x20" |
| 7' | 1400 | 10"x12" | 1120 | 10"x16" | 1750 | 10"x14" | 1400 | 10"x20" | 2100 | 10"x17" | 1680 | 10"x30" |
| 8' | 1600 | 10"x13" | 1280 | 10"x20" | 2000 | 10"x16" | 1600 | 10"x30" | 2400 | 10"x20" | 1920 | 10"x30" |
| 9' | 1800 | 10"x15" | 1440 | 10"x20" | 2250 | 10"x18" | 1800 | 10"x30" | 2700 | 10"x22" | 2160 | 10"x30" |
| 10' | 2000 | 10"x16" | 1600 | 10"x30" | 2500 | 10"x20" | 2000 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" |
| 11' | 2200 | 10"x18" | 1760 | 10"x30" | 2750 | 10"x22" | 2200 | 10"x30" | 3300 | 10"x27" | 2640 | 10"x40" |
| 12' | 2400 | 10"x20" | 1920 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" | 3600 | 10"x29" | 2880 | 10"x40" |
| 13' | 2600 | 10"x21" | 2080 | 2-10"x16" | 3250 | 10"x26" | 2600 | 2-10"x20" | 3900 | 10"x32" | 3120 | 2-10"x30" |
| 14' | 2800 | 10"x23" | 2240 | 2-10"x16" | 3500 | 10"x28" | 2800 | 2-10"x20" | 4200 | 10"x34" | 3360 | 2-10"x30" |
| 15' | 3000 | 10"x24" | 2400 | 2-10"x16" | 3750 | 10"x30" | 3000 | 2-10"x20" | 4500 | 10"x36" | 3600 | 2-10"x30" |

For cfm, static pressure and duct collar sizes other than above, see Air Flow Requirements form no. 14012. Air speeds vary according to duct collar size; average speeds are 1800 fpm exhaust and 1000 fpm supply.

Use above chart for supply air types "P", "E" & "D"; 80% supply air volume shown, 20% from adjacent areas to contain cooking odors within kitchen.

Do not use above chart for untempered short cycle supply type "I"; this should be sized at 40% to 70% of exhaust cfm, 20% from adjacent areas to contain odors remaining amount from ceiling registers approximately 20 ft. from hood - contact factory.

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 FAX[630] 851-5777

AVTEC'S policy of continuous product improvement includes the right to change specifications without notice.

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Project:

Prepared for: Item# 39

Date:

# AUTO WASH VENTILATOR CONTROL PANEL

Model VCWW

AVTEC

U.S. Patent # 4,156,432

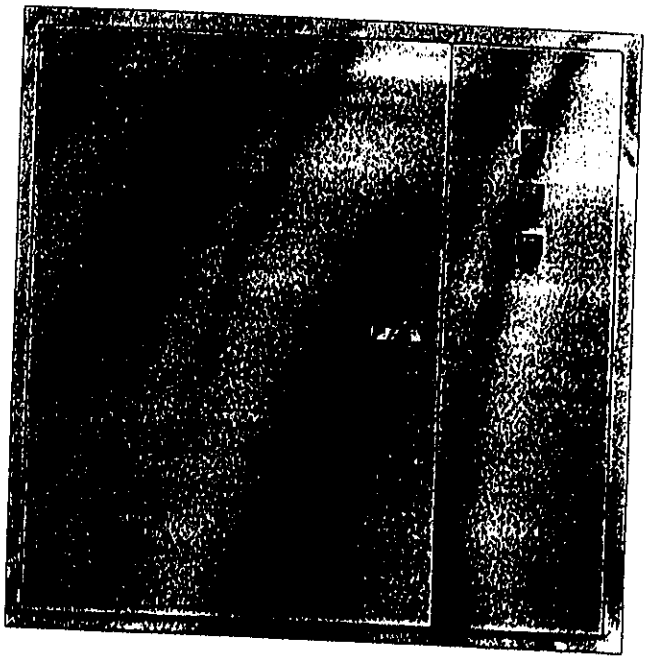
## *ECONOMY CONTROL . . WITH AVTEC*

### APPLICATION DATA

The AVTEC Auto Wash Ventilator Control Panel is supplied with the AVTEC Auto Wash Ventilator. The cabinet houses the electrical and plumbing components necessary to control the exhaust [and air make-up] fan(s), auto wash self-cleaning cycle and plenum fire protection system.

One panel will control one or more fans if operated simultaneously. Each panel will operate up to 50 linear feet of ventilator with a single wash [0-10] minutes]; for over 50 feet, use two or more panels. If hot water and low pressure is limited and sequential washes are desired, we recommend the AVTEC "PAWS" Control Panel.

An electric thermal detector fire switch is mounted in the duct collar and automatically activates the plenum fire protection [spray], closes the adjacent fire damper and turns off the fan. An optional flush mounted or remote manual pull fire switch is available to activate the plenum fire protection [spray] and exhaust fan [to remove fumes]. Surface cooking fire protection should be specified with this system. AVTEC'S MIST-A-FIRE System is recommended if a building sprinkler system is available; the control panel for this system may be combined with the AVTEC "PAWS" Control Panel.



### DESIGN FEATURES

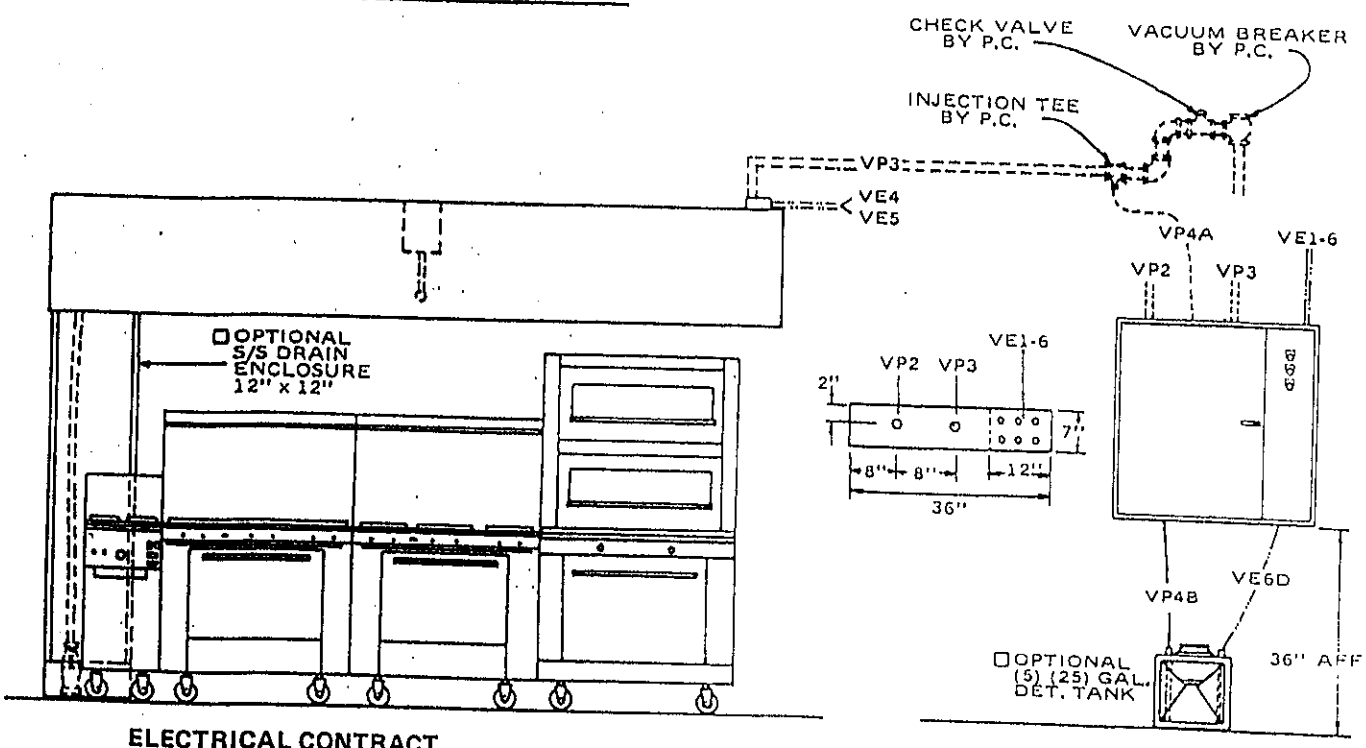
UL NSF

- Automatic Wash System shuts OFF fan and injects detergent and hot water into grease extractor chamber for up to ten minutes
- Optional Manual Fire Switch initiates fire quenching spray in plenum and activates fan to remove toxic fumes.
- Automatic Thermal Fire Detector initiates fire quenching spray in plenum, closes the damper to prevent fire from spreading to the ductwork and deactivates the fan.
- Optional Vent Light Switch may be conveniently mounted on control panel.
- Optional Low Level Detergent Alarm

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 [630] 851-4800

VENT. CONTROL MODEL # VCWW PROJECT:_____ITEM#_____

## SERVICE CONNECTIONS




### ELECTRICAL CONTRACT

**BUILDING SERVICES**

VE1 ☐ 20A 120/1 control power supply
VE2 ☐ 20A 120/1 power supply for vent lights.

**FIELD INTERCONNECTIONS**

VE3 ☐ 120/1 control circuit to fan magnetic motor controller, for exhaust (& supply) fan(s)
VE4 ☐ 20A 120/1 power from AVTEC panel to vent lights.
VE5 ☐ 120/1 to thermo detector damper box.
VE6 ☐ Provide (2W) field interconnects to (remote only)
- A ☐ Manual Pull Fire Switch
- B ☐ Wash Solenoid Valve 120 volt
- C ☐ Detergent Pump 120 volt
- D ☐ Detergent Sensor Probe 20vdc

**CONTROL CABINET SIZE**

Standard: 36" x 36" x 7" d
5 Gal. Det. Tank: 36" x 36" x 10" d
Cold Water Mist: 42" x 42" x 7" d
1½" mounting flange for recessed option.
Add ½" all sides for wall opening.
Weight: 220 lbs. crated

**PLUMBING DATA - LENGTH/SIDE**

| LENGTH | H.W. INLET |
|---|---|
| 0 - 15' | ¾" |
| 16' - 24' | 1" |
| 25' - 50' | 1¼" |
| over 50' | ** |

** Use multi-wash. Contact factory.

H.W. Flow Rate=1.2 GPM/ft. @25psi (140°F for 3-5 min.)

### PLUMBING CONTRACT

**BUILDING SERVICES**

VP2 ☐ ____" hot water (140°F) to control panel (20 to 40 psi)

**FIELD INTERCONNECTIONS**

VP3 ☐ ____" hot water (140°F) to ventilator ____places.
VP4 ☐ 3/8" Detergent tubing
- A ☐ From detergent pump to injection tee.
- B ☐ Inserted in remote detergent tank.

**OPTIONAL**

VP7 ☐ 3/4" cold water to control panel.
VP8 ☐ 3/4" cold water to vent ____places.

NOTE: Other required connections are shown on Ventilator Rough-In Data Sheet.

**IMPORTANT NOTE: The various trades' installation responsibilities must be included in their contracts.**

## SPECIFICATIONS

Provide AVTEC U.L. Listed, NSF approved, (surface) (recessed) wall mounted Auto Wash Ventilator Control Panel, Model No. VCWW to operate AVTEC ventilator fan(s), wash cycle and internal plenum and duct collar fire protection system. Control panel to be 18 gage stainless steel and shall house all electrical and plumbing components.

Electrical components to consist of FAN START, FAN STOP/WASH START & RESET buttons, adjustable auto wash timer, 0 to 10 minutes, detergent pump prime switch, and thermal detector switch. RESET button to interrupt FAN ON or WASH ON modes.

Plumbing components to consist of ball type shut off valve, wye-strainer, pressure-temperature gage, shock absorber, solenoid valve, detergent pump and 2 gallon reservoir.

All components to be pre-wired and pre-plumbed ready for field connection by applicable trades.

### ACCESSORIES

- ☐ Provide illuminated STOP/START buttons.
- ☐ Provide (panel mounted) & (remote) manual pull fire switch.
- ☐ Provide vent light switch.
- ☐ Provide (integral 5 gal.) (remote 5 gal.) (remote 25 gal.) detergent tank (and pump).
- ☐ Low Level Detergent Indicator with Audio Alarm

### OPTIONAL

- ☐ Provide micro-switch in lieu of thermal detector to operate fan and wash spray in fire condition, upon signal from fusible link damper.

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AVTEC'S policy of continuous product improvement includes the right to change specifications without notice

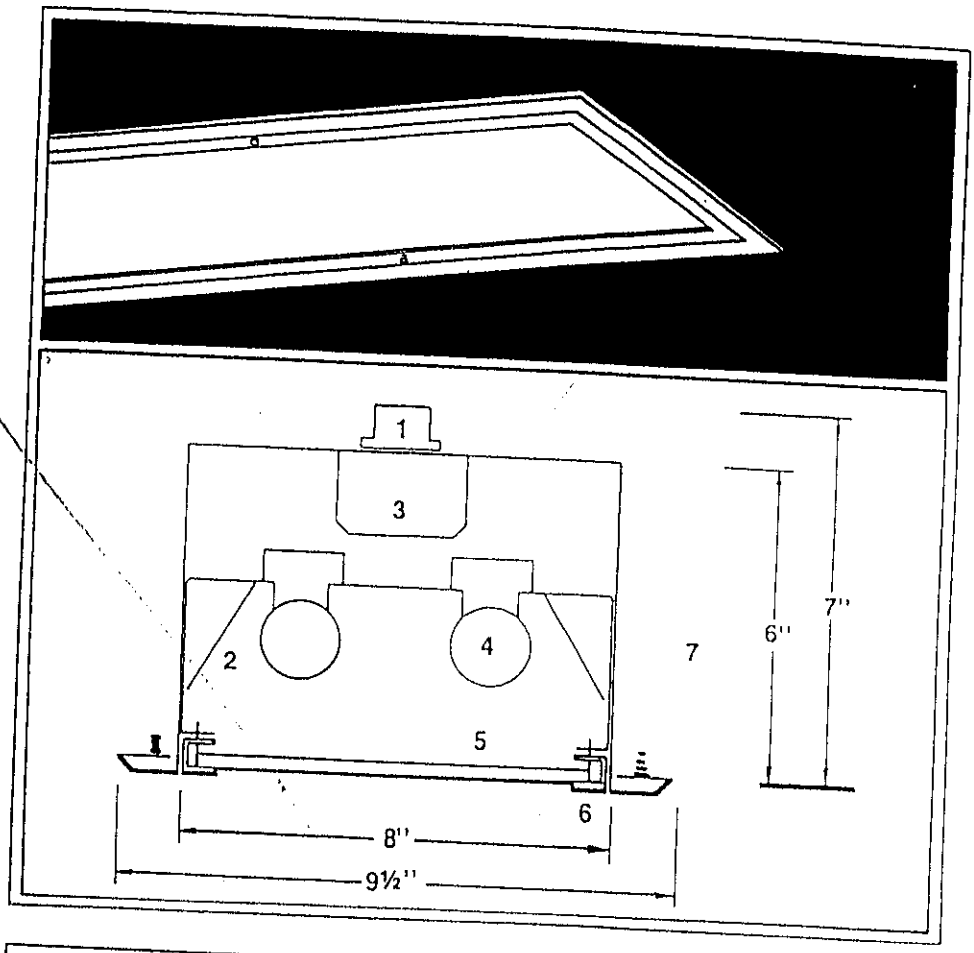
# NSF 8200 Series

#39

## recessed fluorescent cooking hood group

Suitable for use in Commercial Cooking Hoods.

Use inside or on Commercial Cooking Hoods and other Food Handling or Preparing Areas.




1 - **Wiring** Rigid conduit is connected to the special UL listed threaded hub and connections to the fixture made.

2 - **Reflector** Inside reflector with a minimum of 87% diffuse reflective baked white enamel finish.

3 - **Ballast** Standard 120 volt 60 cycle, high power factor, Class P, UL Listed. For other voltages specify on order.

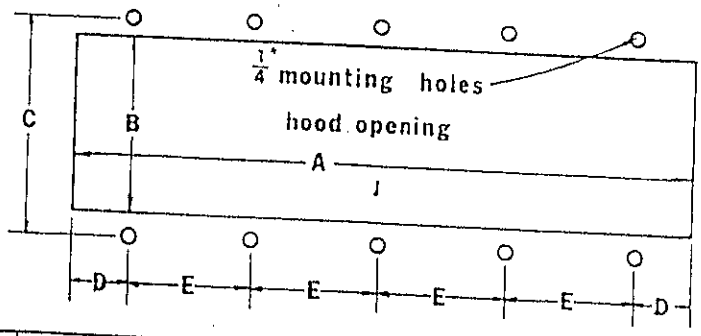
4 - **Lamp** T-12 fluorescent lamps by others.

5 - **Diffuser** Heat and shock resistant crystal 73 tempered, prismatic glass, with prisms on the inside of fixture, is mounted into the door frame and sealed with special gasketing.

6 - **Door Frame** Channel door frame, held with twin springs and chain, is locked with captive stainless steel thumbscrews for easy servicing. All back surfaces are completely sealed with special gasketing.

7 - **Mounting** All NSF Cooking Hood group fixtures are supplied with 8/32 x 3/4 studs. If studs are not needed, fieldcut studs to facilitate installation.

| satin polished stainless trim baked white enamel recessed body | lamps | trim overall | opening required |
|---|---|---|---|
| NSF-8230-RS-2 | 2-F30T12RS | 9½" x 37½" | 8½" x 36½" |
| NSF-8240-RS-2 | 2-F40T12RS | 9½" x 49½" | 8½" x 48½" |



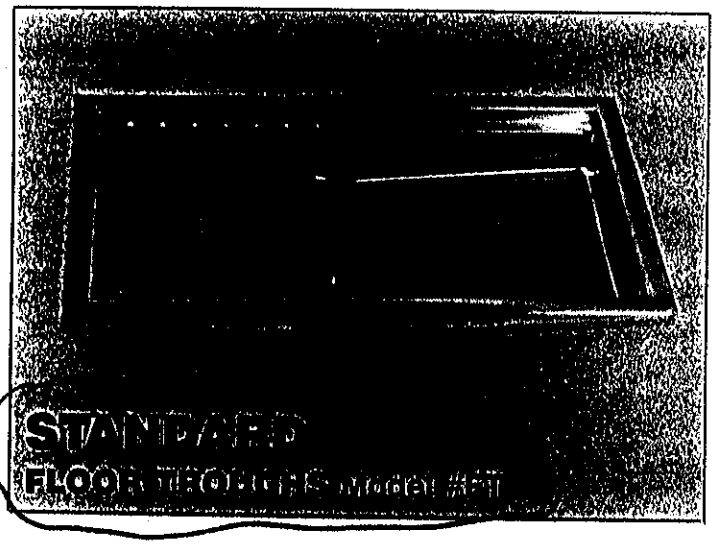

| fixture | A | B | C | D | no. of mtg. holes | E |
|---|---|---|---|---|---|---|
| NSF-8230 | 36½ | 8½ | 9 3/16 | 3¼ | 10 | 7½ |
| NSF-8240 | 48½ | 8½ | 9 3/16 | 3¼ | 10 | 10½ |

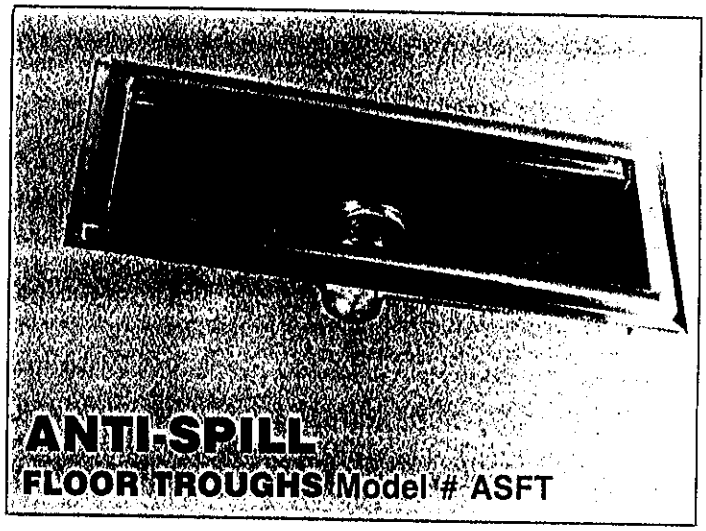

MORRIS KURTZON, INC.

1420 SOUTH TALMAN AVENUE
CHICAGO, ILLINOIS 60608
312/277-2121 TELEX "KURTZON CHGO 25-3169"

ITEM #40

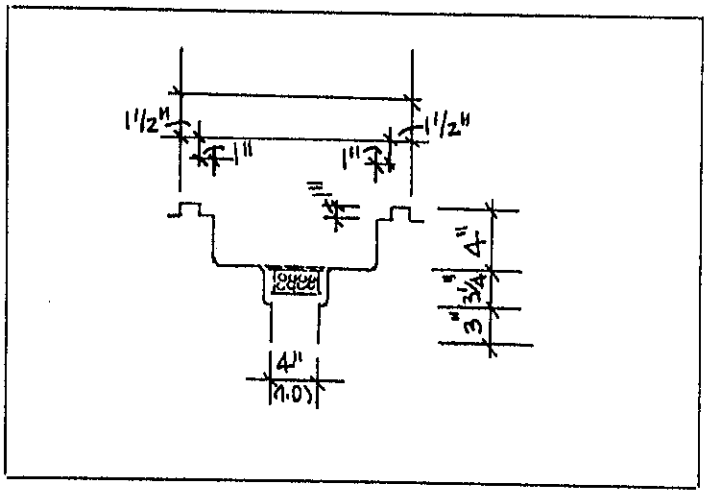
# STANDARD DEPTH FLOOR TROUGHS

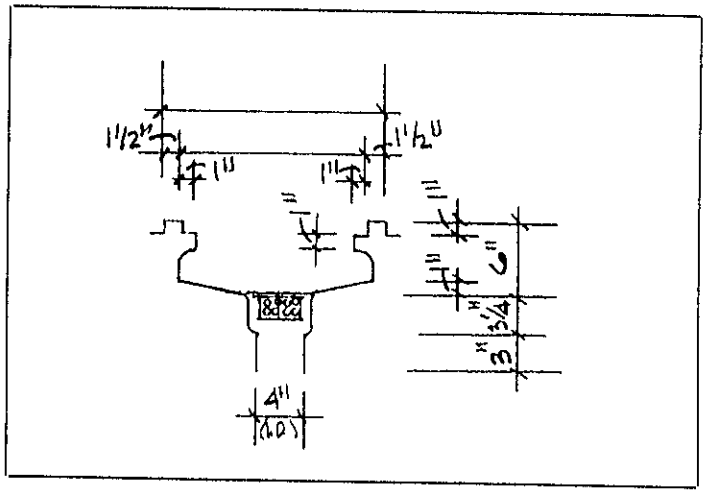



## CONSTRUCTION

All floor troughs are constructed of heavy duty 14 gauge stainless steel type 304- 18-8, completely welded and coved. All welds are ground & polished smooth. Troughs have built-in pitch towards wastes for complete drainage and anchor straps for securing. All troughs are fitted with special stainless steel waste cup with removable perforated stainless steel basket to accommodate up to 3″ waste pipe. Advise size and location of waste outlet.




*NOTE*

*For troughs less than 15″ wide 1½″ top edge will become ¾″.*

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•OFFICE AND SHOWROOM, 310 MARCONI BLVD • FAX: 516-789-3633

# GRATING FOR STANDARD TROUGHS

## SUBWAY GRATING /Model #SG

(All Type 304 Stainless Steel)

Grating to be constructed of 3/16″ x 1″ bars, set in a vertical position with open front and back for ease of draining.

Two (2) 1/2″ rods, set 3″ in from each edge, are wedged thru the bars full length. Three (3) 1/2″ rods are used for grating over 15″ wide.

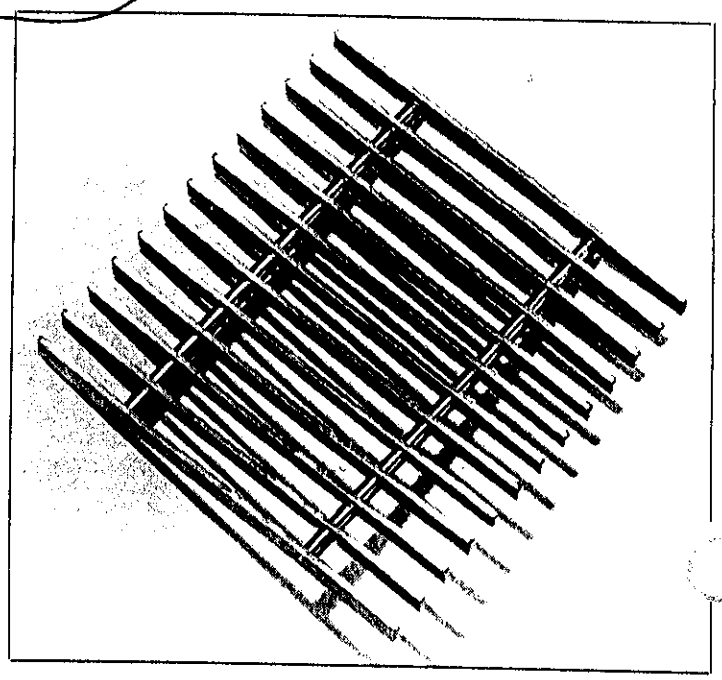
Rods are Heli Arc welded to each 3/16″ bar for rigidity thereby eliminating swaying and crevices.

There is 13/16″ clearance between bars so that wheels of mobile equipment will not become wedged.

Length of gratings are kept at maximum of 20″, for ease of handling and for cleaning in dishwasher.

(Longer lengths available upon request.)

(Bars can be had at any desired centers, specify)



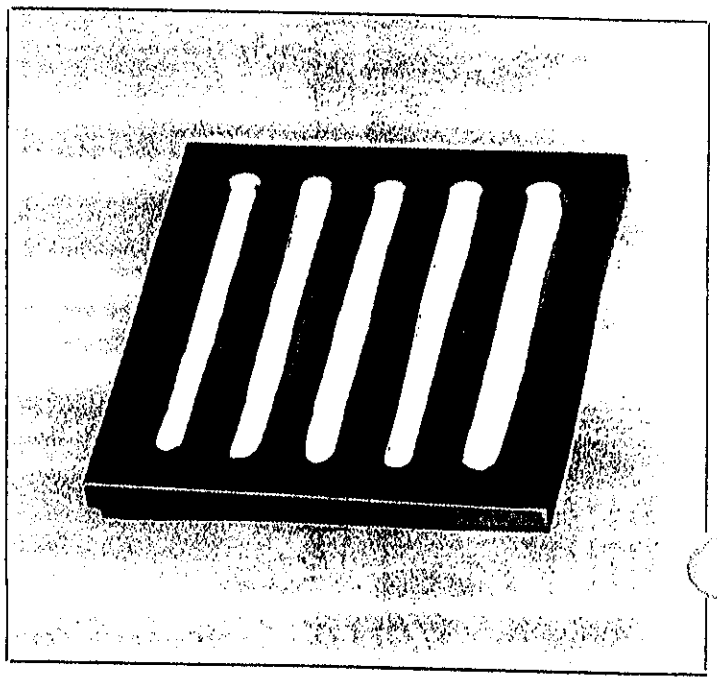
## LOUVERED GRATING /Model #FG

Grating to be fabricated of 14 gauge 18-8 type 304 stainless steel.

Gratings are 1″ thick and have die formed louvers, one piece design with a #3 polished finish.

They are fabricated in approximately 20″ lengths and are easily removed for cleaning in dishwasher.

(Longer lengths available upon request.)



ANSUL

#41 + #72

# FIRE SUPPRESSION SYSTEMS DATA SHEET

# SPECIFICATIONS MODEL R-102

### Total System

The restaurant fire suppression system shall be the pre-engineered, liquid agent, cartridge-operated type with a fixed nozzle agent distribution network. It shall be listed with Underwriters Laboratories, Inc. (UL).

The system shall be capable of automatic detection and actuation with local or remote manual actuation. Accessories shall be available for mechanical or electrical gas line shut-off applications.

The system shall have fire suppression capabilities for the following restaurant hazard areas: ventilating structures including hoods, ducts, plenums, and filters; deep-fat fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, or gas-radiant char-broilers.

A system owner's manual shall be available containing basic information pertaining to system operation. A detailed technical manual shall be supplied including system description, design, installation, recharge, and maintenance procedures, plus accessory installation and reset instructions.

The manufacturer shall provide services through a network of authorized distributors.

### System Equipment

**Agent** – The extinguishing agent shall be a potassium carbonate, potassium acetate-based formulation designed for flame knockdown and securement of grease-related fires. It shall be available in plastic containers with instructions for liquid agent handling and usage.

**Tank and Bracket** – The liquid agent storage tank shall be stainless steel with a three gallon (11.4 L) capacity. The shell assembly shall meet the following pressure test requirements: 100 psi (690 kPa) working pressure, 300 psi (2069 kPa) test pressure, 600 psi (4137 kPa) minimum burst pressure.

The tank shall include an adaptor/tube assembly. The adaptor shall be chromium-plated steel with a 1/4-18 NPT female inlet and a 1/2-14 NPT male outlet. The pick-up tube shall be 304L stainless steel - 1/2 in. O.D. by .028 wall.

A welded steel bracket shall be provided for mounting the tank in a minimum amount of space. The agent tank shall be secured with hinged bracket bands.

**Discharge Nozzles** – Each discharge nozzle shall be tested and listed with the restaurant system for specific applications. Nozzle placement shall be determined by the size of the orifice in the nozzle tip. The nozzle tip shall be brass or chromium-plated brass, and stamped with the part number and flow rating. The nozzle tip retainer and body shall be chromium-plated brass. The nozzle strainer shall be brass with stainless 50 mesh screen. Each nozzle tip shall be covered by a protective blow-off cap.

**Regulated Release Mechanism** – The regulated release mechanism shall be the spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks, depending on the capacity of the nitrogen cartridge used. It shall contain a factory-installed regulator deadset at 100 psi (690 kPa) with an internal relief of approximately 130-150 psi (896-1034 kPa). In the "armed" position, the main spring force to the puncture pin piston shall be 150 lb. (68 kg). The mechanism shall have a visual indicator of the cocked or fired condition without having to open the enclosure.

The regulated release mechanism shall have the following actuation capabilities: automatic actuation by a fusible link detection system; remote manual actuation by a mechanical pull station; local manual actuation by a push button located at the front of the release mechanism enclosure.

The regulated release mechanism shall be housed in a chromium-plated 16 ga. sheet steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain openings for the push button and visual indicator.

The regulated release mechanism shall be compatible with mechanical gas line shut-off devices; or, when equipped with a field or factory-installed solenoid and switch, it shall be compatible with electric gas line or appliance shut-off devices.

**Detection System** – The regulated release mechanism shall be compatible with a fusible link detection system.

The fusible link shall be selected and installed according to the operating temperature in the ventilating system. The fusible links shall be rated as follows:

| Fusible Link Temperature Rating | Use Where Operating Temperature Does Not Exceed |
|---|---|
| 280 °F (130 °C) | 225 °F (107 °C) |
| 360 °F (182 °C) | 290 °F (143 °C) |
| 450 °F (232 °C) | 360 °F (182 °C) |
| 500 °F (260 °C) | 400 °F (204 °C) |

The fusible link shall be supported by a detector bracket/linkage assembly. The detector bracket shall be 16 ga. cold-rolled stainless steel. The detector linkage shall be 20 ga. cold-rolled stainless steel.

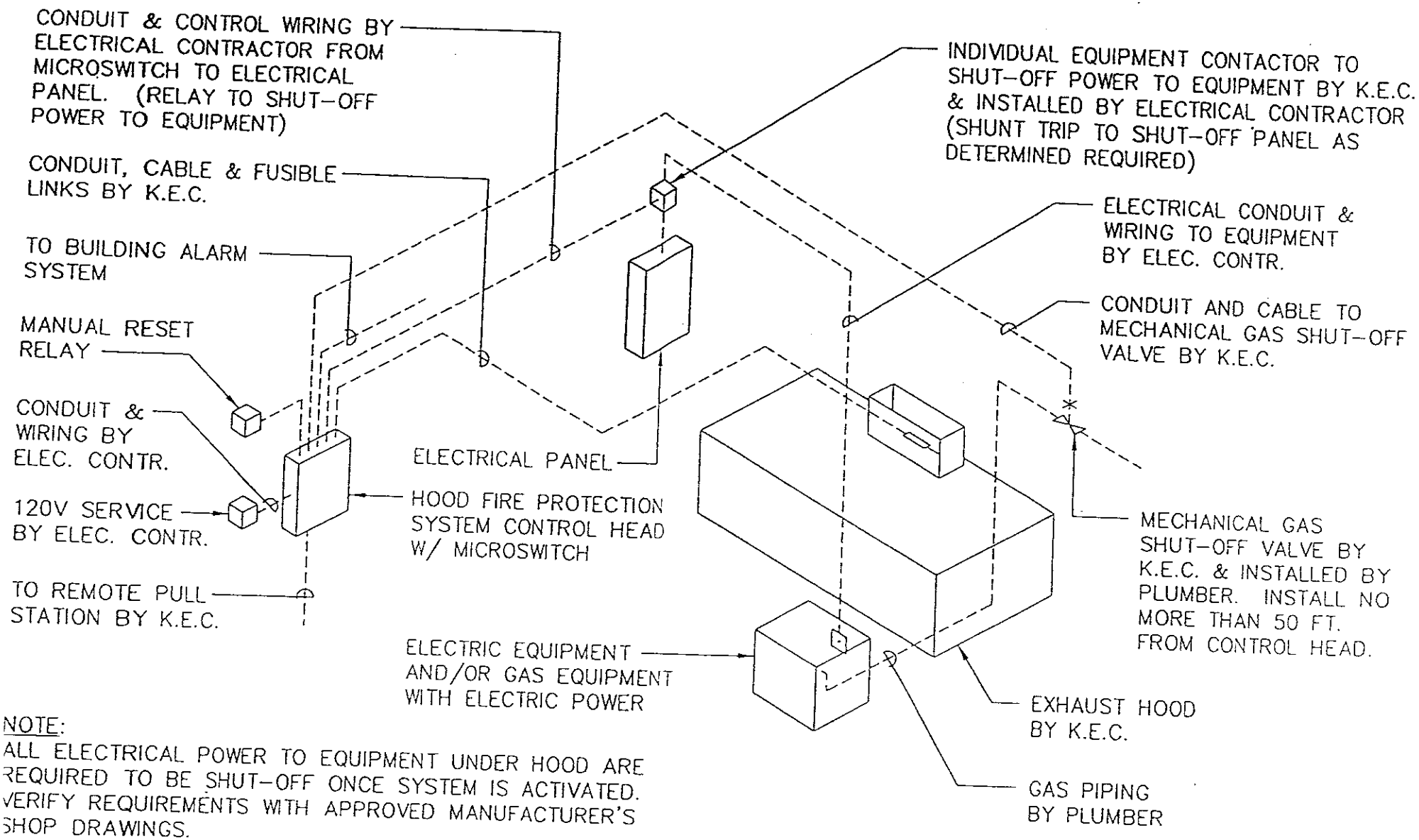
The detector bracket/linkage assembly shall have provisions for connecting 1/2 in. rigid or EMT thin-wall conduit, and 1/16 in. (1.6 mm) diameter flexible stainless steel rope. Changes in the direction of the conduit and steel rope shall be accomplished with die cast aluminum alloy, 90° pulley elbows.

### Accessory Equipment

The following accessory equipment shall be available, and shall be compatible with the liquid agent restaurant fire suppression system:

**Remote Manual Pull Station** – If the release mechanism is not accessible for manual actuation, a remote manual pull station shall be provided as the primary means of manual actuation. The pull station shall be the glass break-rod type, and shall be connected to the release mechanism trip lever by means of a 1/16 in. (1.6 mm) diameter stainless steel rope and 1/2 in. conduit. The pull station shall be located at a distance of not more than 125 ft. (38 m) from the release mechanism. The mounting height of the pull station shall be in accordance with the authority having jurisdiction.

**Mechanical Gas Line Shut-Off Valve** – A UL listed, mechanical gas valve shall be provided when automatic gas line shut-off is required for indoor applications. It shall be adapted to the release mechanism cartridge receiver by means of a pneumatic piston-type air cylinder. The valve shall have resilient seating




NOTE:
ALL ELECTRICAL POWER TO EQUIPMENT UNDER HOOD ARE REQUIRED TO BE SHUT-OFF ONCE SYSTEM IS ACTIVATED. VERIFY REQUIREMENTS WITH APPROVED MANUFACTURER'S SHOP DRAWINGS.

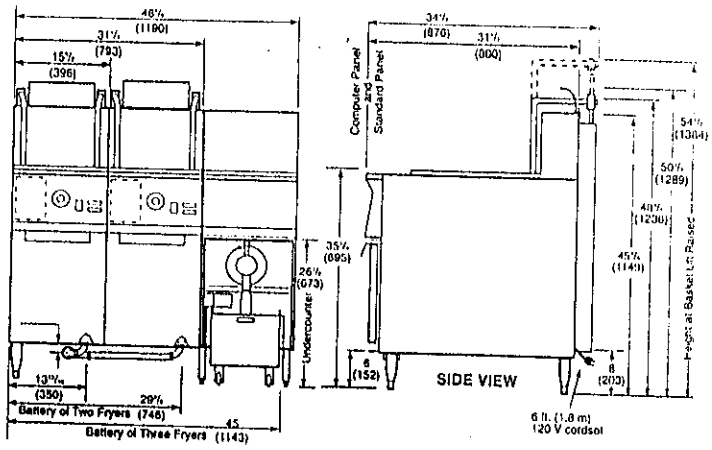
# HOOD FIRE PROTECTION WIRING DIAGRAM

NOT TO SCALE

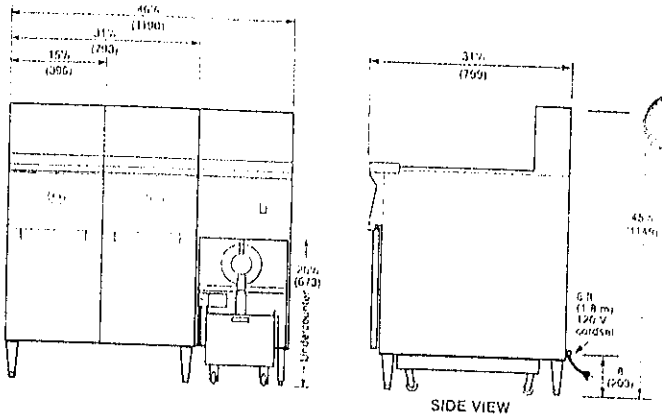
#72

ITEM #42

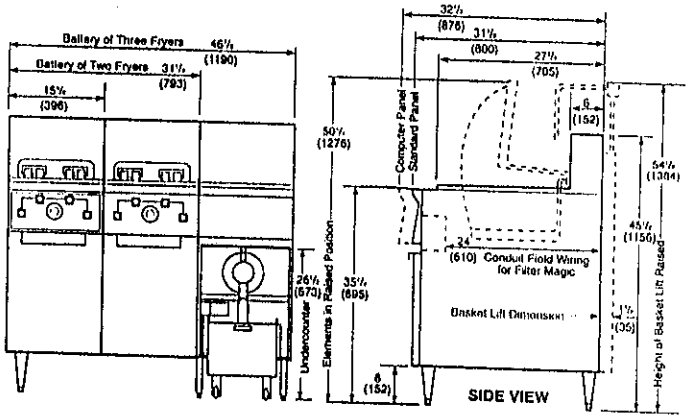
FILTER MAGIC® II FILTRATION SYSTEMS



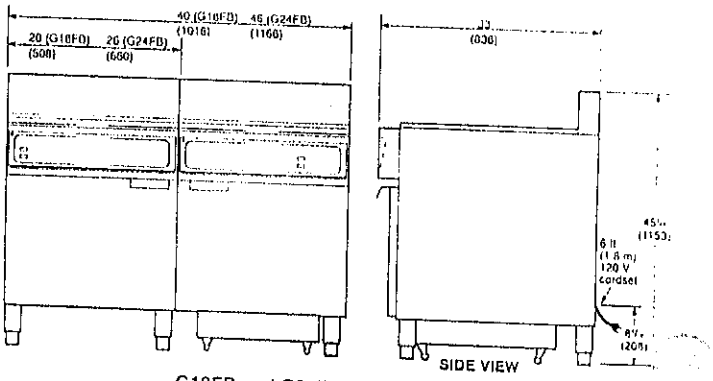

MJ45E and MJH50 FILTER SYSTEM



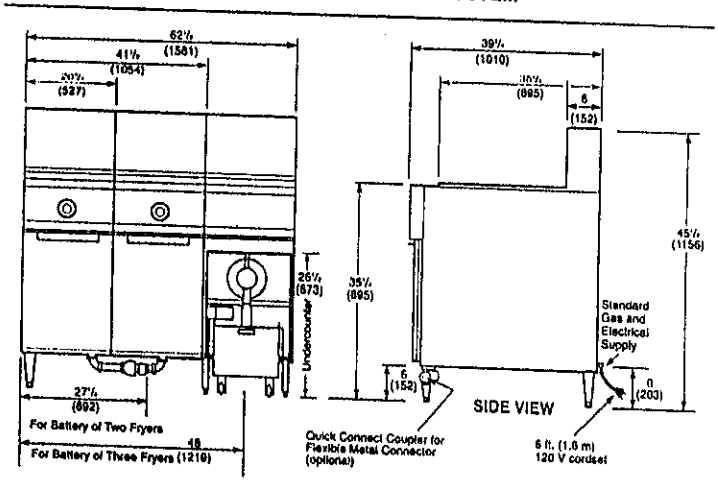

MJ235 FILTER SYSTEM




H14, H17 and H22 FILTER SYSTEM




G18FB and G24FB FILTER SYSTEM*




MJCFE FILTER SYSTEM

*NOTES*

1. *FILTER MAGIC® II available with the following models: MJH50, MJ45E, MJ35, MJCFE, H14, H17, H22, G18FB, G24FB (G18FB and G24FB not available for export).*
2. *With Filter Magic, filter can be located anywhere in the battery — please specify.*
3. *FOOTPRINT™ FILTER SYSTEM available with the following models: MJH50, H14, H17 (not illustrated).*
4. *Filter drawer will always be located under the left two fryers in any battery with up to six FootPrint units.*
5. *Filter Magic® II Systems are also available on fryers equipped with computers and/or automatic basket lifters.*
6. *Casters and quick disconnect gas lines optional.*
7. ***Please see individual engineering specification sheets for details on individual fryers.***

inches
mm

**Frymaster®**

A WELBILT Company

8700 Line Avenue, P.O. Box 51000,
Shreveport, Louisiana U.S.A. 71135-1000,
Phone 318-865-1711, Fax 318-868-5987
Call Toll free 1-800-221-4583

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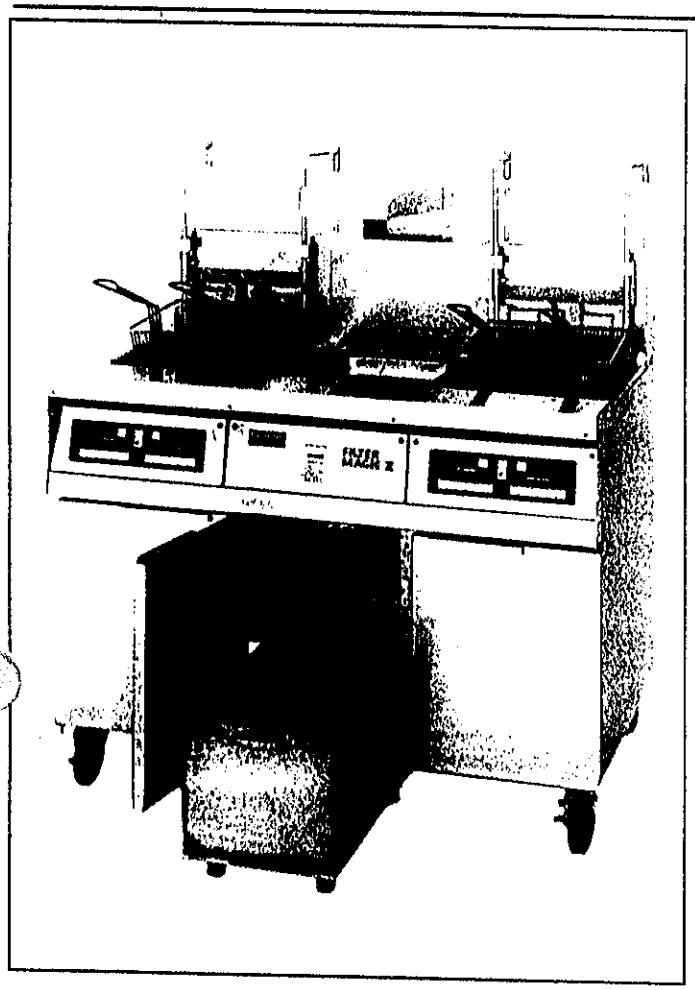
ITEM NO. #42

NA File No. 35-C-11

Frymaster®

A WELBILT Company

# FILTER MAGIC® SYSTEM
## For Gas and Electric Fryers
### MJH50, MJ35G, MJ45E, MJCFE, G18FB, G24FB, H14, H17, H22, H14TD, H17TD, H22TD



- **Extends shortening life**
- **Fast, safe, easy to operate**
- **Automatic, hands-off filtration**
- **Convenient built-in, full-sized or undercounter filter cabinet**

The Frymaster Filter Magic® System is specifically designed to extend shortening life. Filter Magic® does it fast, safely, simply; reducing operating costs and yielding a more consistent, higher-quality product.

Fifty pounds (28 litres) of oil can be automatically filtered completely in about three minutes, while other fryers in the system are still in use. Any fryer in the battery can be filtered without moving the filter from fryer to fryer.

The process is as easy as: 1. Switch off the fryer; 2. Open drain valve; 3. Start filter pump. No special training required, nothing hot or messy to handle. Filter Magic® automatically filters oil as Frymaster's exclusive Power Shower™ directs jets of hot oil down every inch of the frypot, flushing crumbs and sediment into the filtering system. After filtering, fresh oil is automatically pumped back into the frypot.

Filter Magic® is available in full-sized and undercounter cabinets that can be batteried to either side of most Frymaster gas and electric fryers. The full-sized cabinet can be purchased with cut-out for optional cafeteria-style or scoop-type pan and a rod-style or bulb-type heat lamp can be mounted to the cabinet, making a complete warming station.

Up to six of the following same Frymaster models can be batteried to each side of the Filter Magic System®: MJH50, MJ35G, MJ45E, H14, H17, H22, H14TD, H17TD. Up to four MJCFE, G18, G24 fryers can be batteried to each side of a Filter Magic System®.

## STANDARD FEATURES

- **Power Shower™**
- **1/3 H.P. Motor With 5.5 GPM**
- **Stainless Steel Inner and Outer Filter Pans**
- **Filter Heater**
- **Filter Screen**
- **Crumb Screen**

ISO 9002

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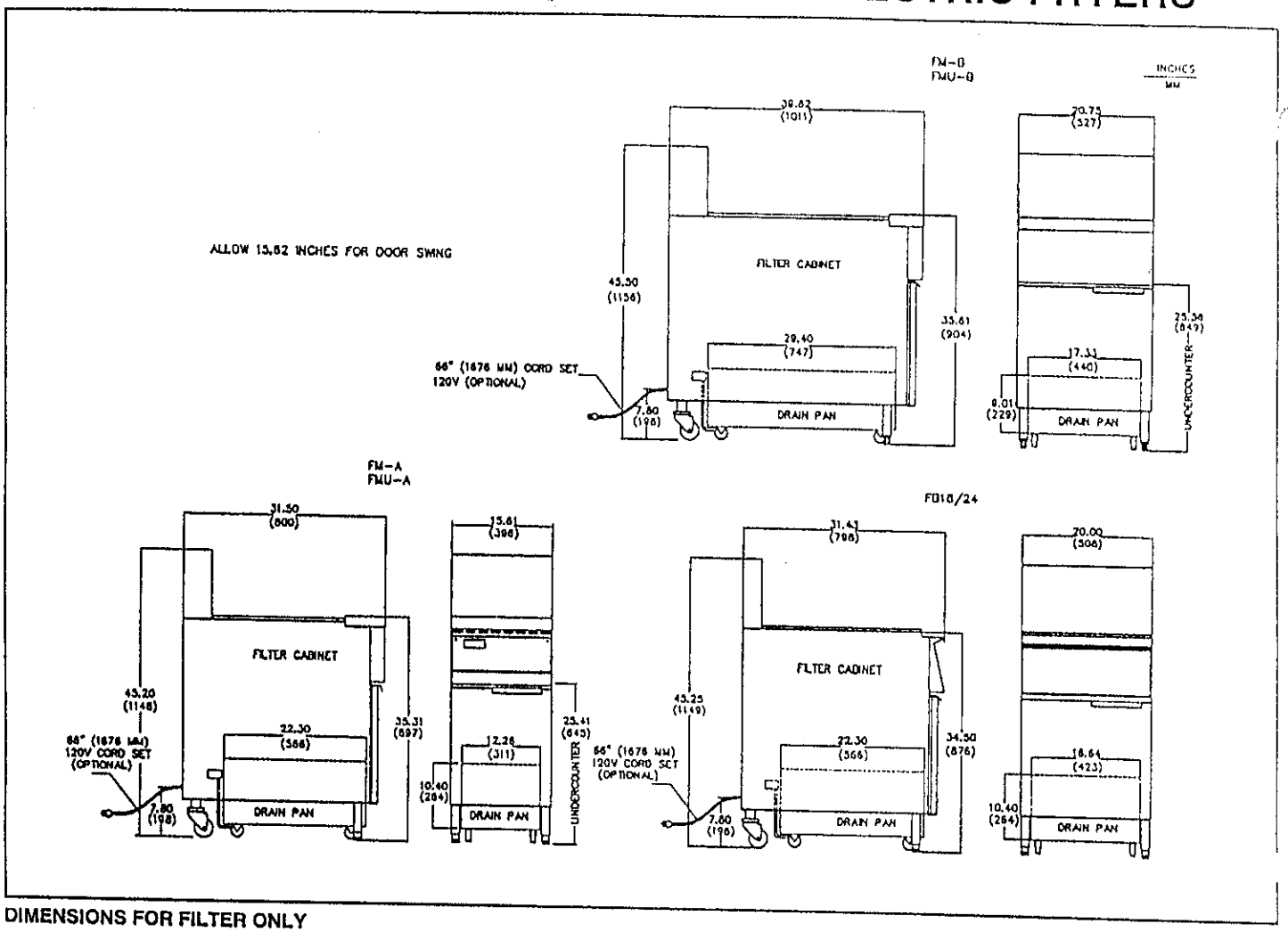
# FILTER MAGIC® SYSTEM FOR GAS AND ELECTRIC FRYERS




## DIMENSIONS FOR FILTER ONLY

| MODEL NO. | SHORTENING CAPACITY | SIZE | | | NET WEIGHT | SHIPPING INFORMATION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HEIGHT | WIDTH | LENGTH | | WEIGHT | CLASS | CUBE | HEIGHT | WIDTH | LENGTH |
| FM-A | 50 lbs. (28 Litres) | 45.20" (1148 mm) | 15.61" (396 mm) | 31.50" (800 mm) | 95 lbs. (43 kg) | 125 lbs. (57 kg) | 85 | 21.31 cu. ft. | 46.50" (1181 mm) | 22" (559 mm) | 36" (914 mm) |
| FM-B | 80 lbs. (44 Litres) | 45.50" (1156 mm) | 20.75" (527 mm) | 39.82" (1011 mm) | 115 lbs. (52 kg) | 150 lbs. (68 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |
| FMU-A Undercounter | 50 lbs. (28 Litres) | 25.41" (645 mm) | 15.61" (396 mm) | 31.50" (800 mm) | 80 lbs. (36 kg) | 110 lbs. (50 kg) | 85 | 19.48 cu. ft. | 42.50" (1080 mm) | 22" (559 mm) | 36" (914 mm) |
| FMU-B Undercounter | 80 lbs. (44 Litres) | 25.56" (649 mm) | 20.75" (527 mm) | 39.82" (1011 mm) | 90 lbs. (41 kg) | 125 lbs. (57 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |
| FB18/24 | 50-64 lbs. (28-36 Litres) | 45.25" (1149 mm) | 20.00" (508 mm) | 31.43" (798 mm) | 105 lbs. (48 kg) | 145 lbs. (66 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |

## HOW TO SPECIFY

| | |
|---|---|
| FM-A | Full sized Filter Magic system to battery with MJH50, MJ35G, MJ45E, H14, H17, H22, EPH14, EPH17 |
| FM-B | Full sized Filter Magic system to battery with MJCFE |
| FMU-A | Undercounter Filter Magic system to battery with MJH50, MJ35, MJ45E, H14, H17, H22, EPH14, EPH17 |
| FMU-B | Undercounter Filter Magic System to battery with MJCFE |
| FB18/24 | Full sized Filter Magic System to battery with G18FB and G24 FB |

FILTER MAGIC CABINET CAN BE LOCATED ANYWHERE IN THE BATTERY --PLEASE SPECIFY.

## OPTIONAL ACCESSORIES

- ☐ Rod-style heat lamp assembly
- ☐ Bulb-style heat lamp assembly
- ☐ Cafeteria-style dump pan
- ☐ Perforated scoop-type dump pan
- ☐ Filter envelopes
- ☐ Casters
- ☐ Filter cover
- ☐ Stainless steel door, cabinet, sides

## STANDARD ACCESSORIES

- Filter paper (25 Ct.)
- Filter powder (100 1-cup applications)
- Filter brush
- Fryer's friend (cleanout rod)

## NOTES

- Supply voltage for filter is obtained from the line voltage of fryer, except for 480V, which will have a separate 120V, 60Hz (9.0 Amp) power supply cord supplied with unit.
- Control Voltage: 24V, 60Hz
- Export Supply Voltage: 220V, 50Hz (4.5 Amp)
- FB18 and FB24 not available for export
- Filter Magic systems are also available on fryers equipped with computers and/or automatic basket lifters.
- For applications where space is premium, please see Frymaster's FootPrint® Filtration specifications.

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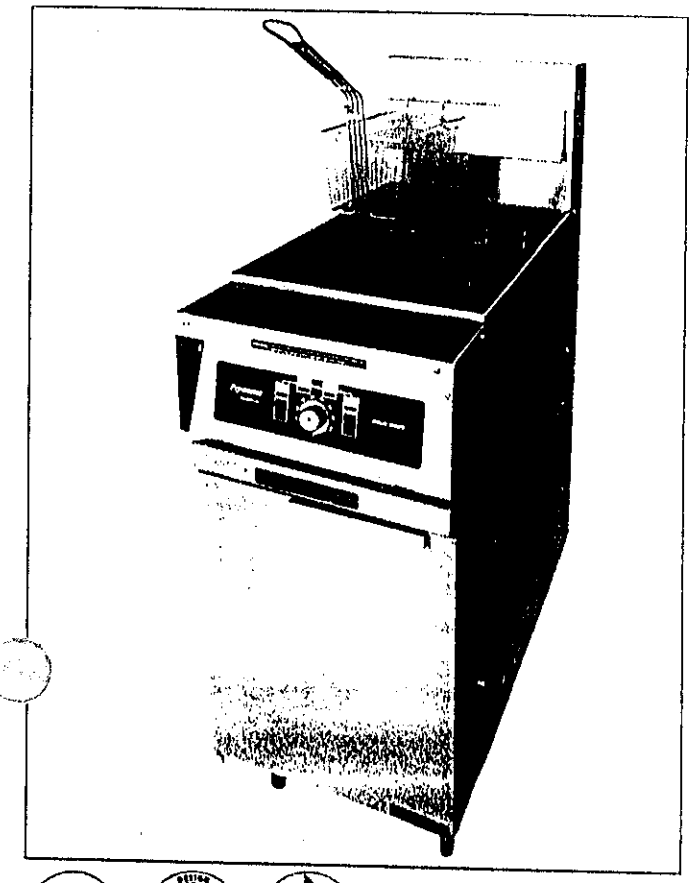
ITEM NO. #42

**Frymaster**

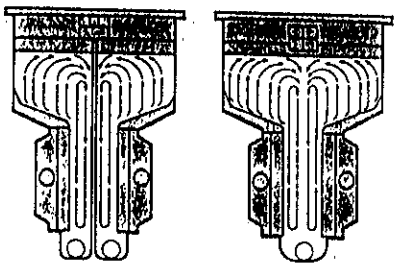
A WELBILT Company

# MJH50 and MJH50-2 Gas Fryers

## Specifically designed for high production frying



ISO 9002



MJH50-2 MJH50

*Unique frypot design with deep cold zone and turbocharged, infrared burners.*

*STANDARD FEATURES*

- *Electronic ignition, melt cycle*
- *Open-pot design (split or full), no tubes, easy-to-clean*
- *Centerline temperature sensor, 7- to 10-second response to loads*
- *Solid-state controller*
- *Deep cold zone*
- *Low flue temperature*
- *Boil-out mode*
- *Lifetime limited warranty on stainless frypot*
- *Turbo jet infrared burners*

The MJH50 has a maximum 50-lbs. (25 litres*) shortening capacity. The frying area is 14 x 15 in. (356 x 381 mm). This 80,000 BTU (84.4 megajoules) (23.4 kW) model is designed for high-volume frying with maximum fuel efficiency. The solid-state controller assures pinpoint accuracy of shortening temperature, extending shortening life and producing a uniformly-cooked product. The sensor is mounted in the center to permit quick sensing of any temperature drop caused by cold food placed in either side of the cooking area. The infrared power burner directs its heat on a large heat transfer area to fry more product with less fuel consumption. The open-pot design has no hard-to-clean tubes and can easily be wiped down and cleaned by hand.

The large cold zone catches crumbs and sediment from the frying area. Since these particles are trapped in the cold zone, they do not carbonize, contaminate shortening or cling to fried products.

The MJH50 model uses a 120V (220V for export) supply. Multiproduct frying computers, basket lifters and Filter Magic® or FootPrint® Systems are available. Up to six fryers can be batteried to the right side of a single FootPrint System. Up to six fryers can be batteried to either side of a Filter Magic System.

The solid-state controls, electronic ignition and melt cycle are standard.

Boil-out mode is activated by setting the temperature to 200°F.

Each side of the MJH50-2 -- split pot fryer operates on 40,000 BTU/hr. (42.2 megajoules) (11.7 kW), has a maximum shortening capacity of 25 lbs. (12 litres*), and has a frying area of 6-1/2 x 15 inches (165 x 381 mm). This fryer has all of the features and options of the MJH50 and gives the operator the discretion of using only half the fryer

**Litre conversions are for solid shortening at 70°F (21°C).*

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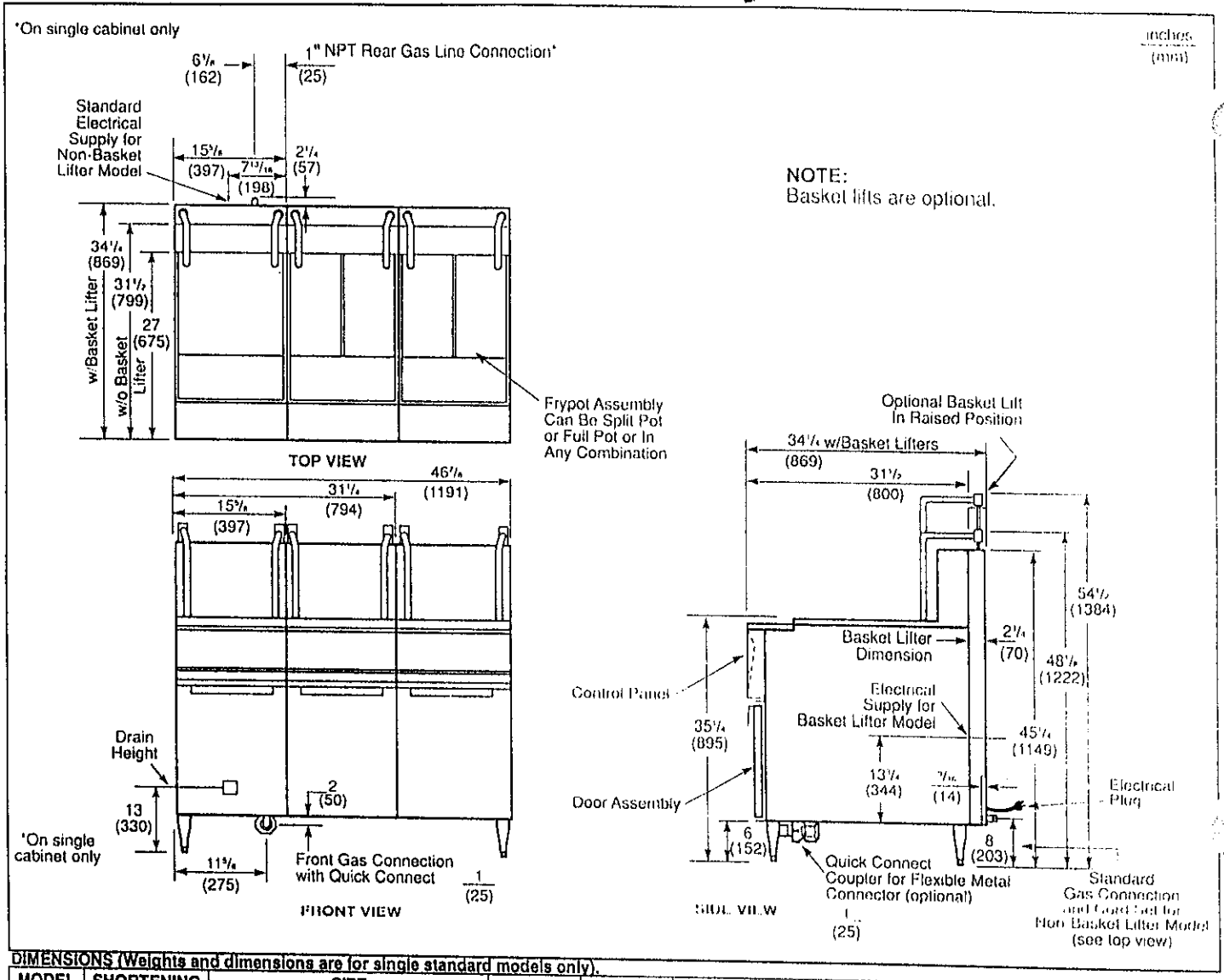
# MJH50 and MJH50-2 Gas Fryers




**DIMENSIONS (Weights and dimensions are for single standard models only).**

| MODEL NO. | SHORTENING CAPACITY | SIZE HEIGHT | SIZE WIDTH | SIZE LENGTH | NET WEIGHT | DRAIN HEIGHT | SHIPPING INFORMATION WEIGHT | SHIPPING INFORMATION CLASS | SHIPPING INFORMATION CUBE | SHIPPING DIMENSIONS HEIGHT | SHIPPING DIMENSIONS WIDTH | SHIPPING DIMENSIONS LENGTH |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MJH50<br>MJH50-2 | 50 lbs. (25 litres)<br>25 lbs. (12 litres) ea. side | 45.25"<br>(1149 mm)* | 15.62"<br>(397 mm) | 31.50"<br>(800 mm) | 160 lbs.<br>(73 kg) | 13"<br>(330 mm) | 202 lbs.<br>(92 kg) | 85 | 21.32 cu. ft. | 46.50"<br>(1181 mm) | 22"<br>(559 mm) | 36"<br>(914 mm) |

*without basket lifts

**POWER REQUIREMENTS**

| MODEL NO. | NATURAL GAS | LP GAS | ELECTRICAL | EXPORT |
|---|---|---|---|---|
| MJH50 | 80,000 BTU input (84.4 megajoules) (23.4 kW) | 80,000 BTU input (84.4 megajoules) (23.4 kW) | Non-Basket Lift 120V (1.0 AMP) 220V (0.5 AMP) Basket Lift 120V (7.0 AMP) 220V (3.5 AMP) | 220V-240V 50 Hz 3.5 AMP |
| MJH50-2 | 40,000 BTU input each side (42.2 megajoules) (11.7 kW) | 40,000 BTU input each side (42.2 megajoules) (11.7 kW) | | |

**NOTES**

Supply Voltage 120V 60Hz -- Control Voltage 24V 60 Hz.
120 VAC 5 ft. (1.5 m) grounded cord set provided.
Recommended minimum store manifold pressure to be 6" W.C. for NAT Gas, and 11" W.C. for L.P. Check plumbing codes for proper supply line sizing to attain burner manifold pressure of 3.0" W.C. natural or 8.25" W.C. L.P. Incoming supply line should be 1-1/2". NOTE: All units whether single or in battery require 1" connection. Should flexible gas line be used, it must be AGA approved, commercial type and at least 1" I.D.

**CLEARANCE INFORMATION**

A minimum of 24" (610 mm) should be provided at the front of the unit for servicing and proper operation, and 6" (152 mm) between the sides and rear of the fryer to any combustible material.

**HOW TO SPECIFY**

| | |
|---|---|
| MJH50 | Control panel, solid-state controller, electronic ignition, melt cycle, sealed ON/OFF switch |
| MJH50-2 | Split pot with same features as full pot plus dual controls to operate each pot independently |
| SD | Stainless steel frypot and door, enamel cabinet |
| SC | Stainless steel frypot and cabinet sides |
| FMH50/ FMH50-2 | Filter Magic System can be batteried with up to six MJH50 or MJH50-2 or any combination of the two not exceeding six units on either side of the filter |

**OPTIONAL ACCESSORIES**

- ☐ Automatic Basket Lifters, computer or timer controlled Computer Magic® III Frying Computer (multiproduct)
- ☐ Casters
- ☐ Frypot cover
- ☐ Flexible metal connector with quick-connect coupler
- ☐ Stainless steel apron drain with basket (interchangeable right or left side)
- ☐ Sediment tray
- ☐ Screen type basket support
- ☐ Dump Station and Food Warmer
- ☐ Filter Magic® System -- Up to six split or full pots or combination can be batteried to either side of Filter Magic System
- ☐ FootPrint® System -- Up to six units; split pot, full pot, or combination can be batteried to the right side of the FootPrint System

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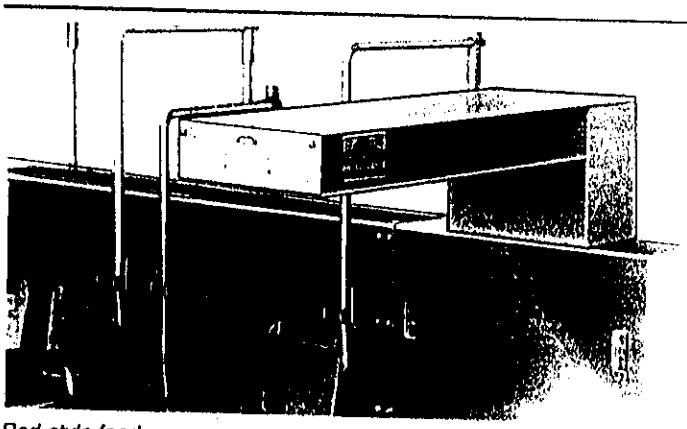
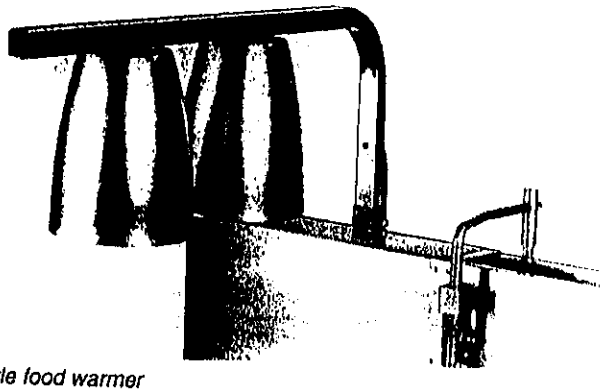
ITEM NO. #42

# Food Warmers

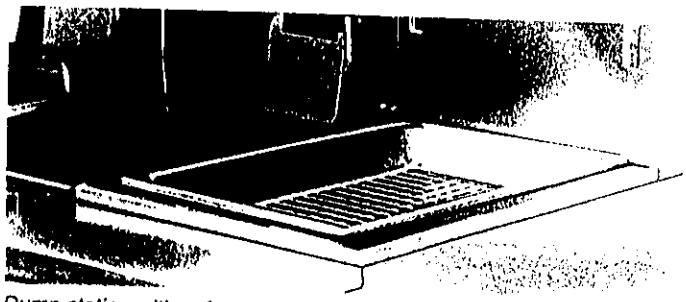
## Filter Magic®
## Food Warmers and Dump Stations



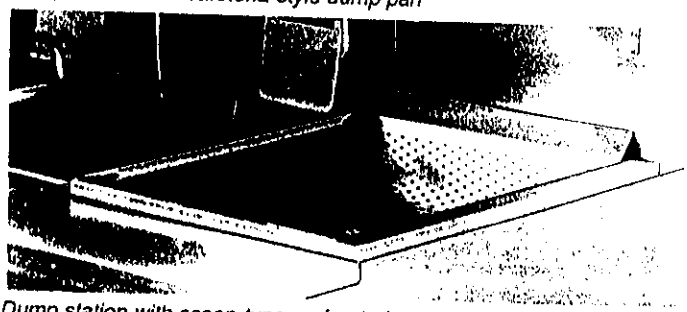
*Rod-style food warmer*



*Bulb-style food warmer*



*Dump station with cafeteria-style dump pan*



*Dump station with scoop-type perforated pan*

- Keeps food fresh and hot
- Durable construction, easy to clean
- Indicator lights "ON/OFF" switch
- Stainless steel cafe pan, 12" x 20" x 2-1/2" (305 x 508 x 64 mm) with mesh screen
- Optional scoop-type, perforated pan, 13.50" x 18.50" x 5.25" (343 x 4610 x 133mm)

THE RECTANGULAR, ROD-STYLE FOOD WARMER produces an 18" (457 mm) heat pattern over the entire length of the unit to gently warm cooked food with radiant heat to assure peak flavor without cooking or drying. The shell is manufactured with durable stainless steel and aluminum alloys and is easy to clean. "ON/OFF" switch, indicator light and a 6' (1.8m) cord set are mounted in the shell. Mounting brackets and hardware are provided for installation. This unit is NSF, UL and CSA approved and can be used with either the cafeteria-style pan with mesh screen or the perforated curved scoop pan for quick, easy bagging.

THE BULB-STYLE FOOD WARMER is constructed of aluminum alloys for long life and easy cleaning. Two attractive lamps mounted on an adjustable arm emit controlled, efficient infrared heat to keep foods hot and fresh. A 6' (1.8 m) cord set with in-line "ON/OFF" switch is provided. This unit is NSF, UL, and CSA approved and can be used with either the cafeteria-style pan with mesh screen or with the perforated, curved scoop pan for quick, easy bagging.

*Note: Unless otherwise specified, rod-style heat lamp and cafeteria-style dump pan will be supplied with Filter Magic System.*

ISO9002

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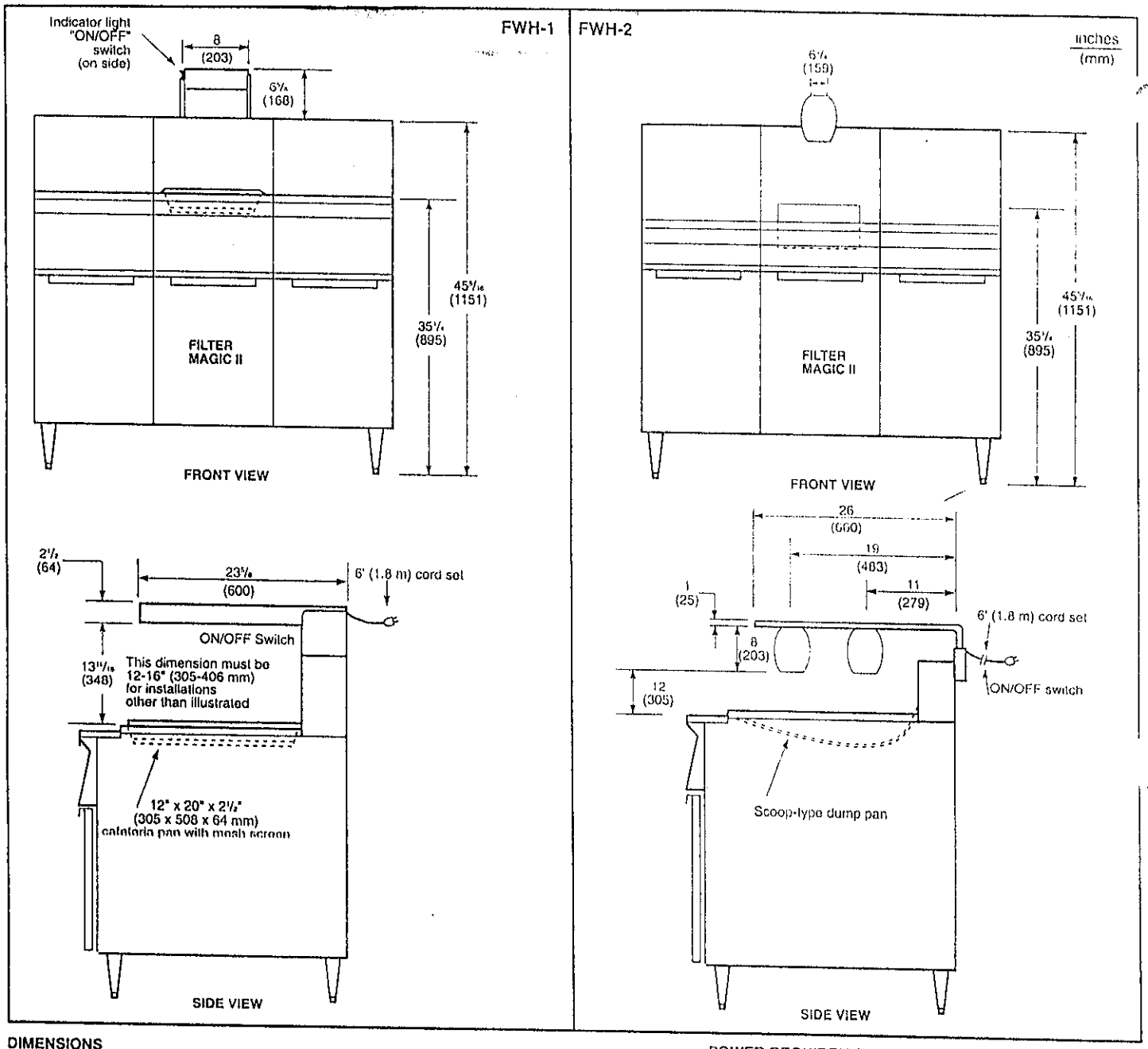
# Filter Magic® Food Warmers and Dump Stations




**DIMENSIONS**

| MODEL | DEPTH | WIDTH | LENGTH |
|---|---|---|---|
| ROD -STYLE FOOD WARMER | 2.50" (64 mm) | 8" (203 mm) | 23.60" (599 mm) |
| BULB-STYLE FOOD WARMER | 8" (203 mm) | 6.25" (159 mm) | 26" (660 mm) |
| CAFETERIA-STYLE DUMP STATION | 2.50" (64 mm) | 12" (305 mm) | 20" (508 mm) |
| SCOOP-STYLE DUMP STATION | 5.25"* (133mm) | 13.50" (343 mm) | 18.50" (470 mm) |

*Depth is shown for deepest point in pan.

**POWER REQUIREMENTS**

| VOLTAGE | 120 | 208 | 240 |
|---|---|---|---|
| AMPS | 6.9 | 4.0 | 3.4 |

INDICATE DESIRED VOLTAGE

**NOTES**

Food Warmers 825 Watts

**HOW TO SPECIFY**

| | |
|---|---|
| FWH-1 | Rod-style food warmer with cafeteria pan. |
| FWH-1A | Rod-style food warmer with scoop-style pan. |
| FWH-2 | Bulb-style food warmer with scoop-style pan. |
| FWH-2A | Bulb-style food warmer with cafeteria-style pan. |

**OPTIONAL ACCESSORIES**

Food warmers/dump stations are optional accessories for Frymaster Filter Magic® Systems. Components are also available separately to fit existing Frymaster filter cabinets and spreader cabinets.

INDICATE DESIRED DUMP PAN -- UNLESS OTHERWISE SPECIFIED, ROD-STYLE HEAT LAMP AND CAFETERIA-STYLE DUMP PAN WILL BE SUPPLIED.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Delfield

Project _____

Item Number #43

Quantity _____ Date _____

Approval _____

# SRR-S/SFR-S

## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units mounted on 4" (10.16) casters.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon-insulated double-pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain –10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

MODEL SRR1-GHSH

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray Slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 6" (15.24 cm) diameter legs (adds 2" to over height of unit)

c UL NSF UL 404A

The Delfield Company, P.O. Box 470, Mt. Pleasant, MI 48804-0470, U.S.A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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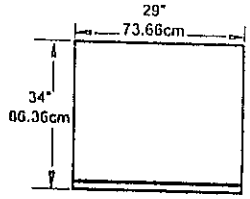
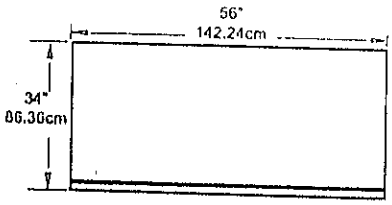
**Delfield**

# SRR-S/SFR-S

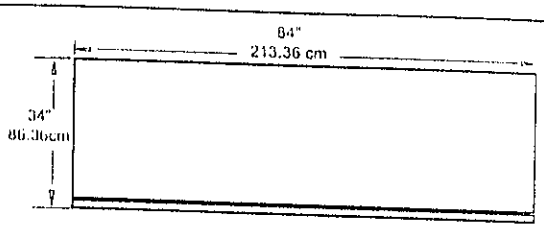
## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers



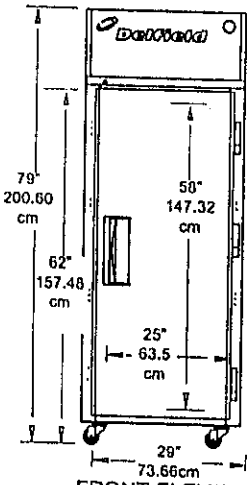

PLAN VIEW



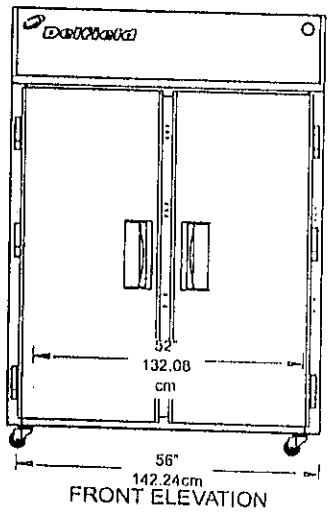

PLAN VIEW




PLAN VIEW




FRONT ELEVATION

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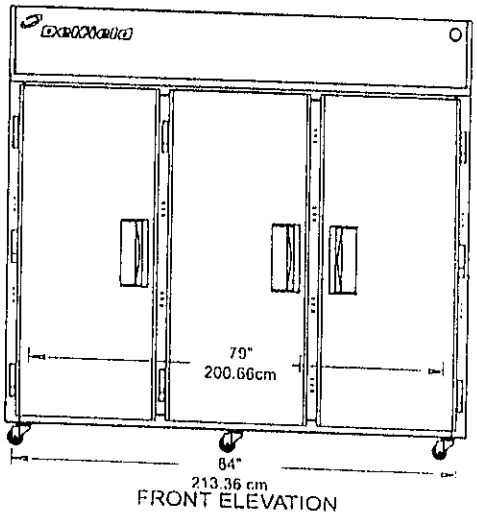
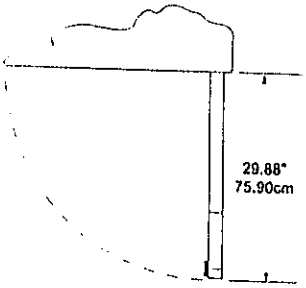
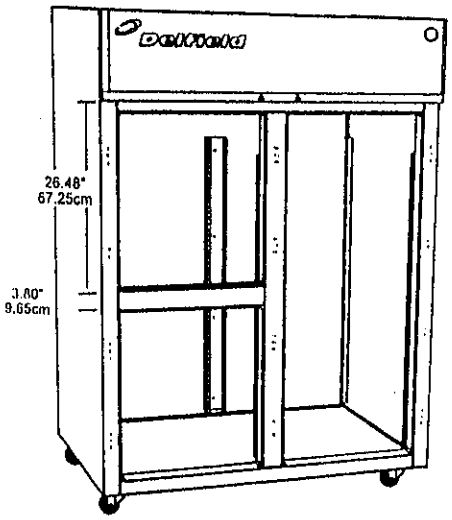
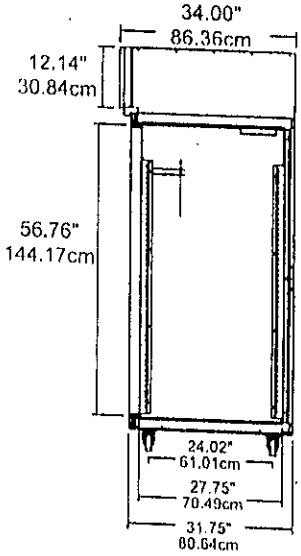



FRONT ELEVATION




DOOR CLEARANCE DETAIL




## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| **REFRIGERATORS** | | | | | | | | | | |
| SRR1-S | 115 | 8.5 | 24.96 | 12.87 | 1 | 1/4 | 758 | 2015 | 592 | 5-15P |
| SRR2-S | 115 | 10.8 | 51.92 | 27.5 | 2 | 1/3 | 1374 | 2943 | 856 | 5-15P |
| SRR3-S | 115 | 12.3 | 78.89 | 40.5 | 3 | 1/2 | 1971 | 3894 | 1088 | 5-20P |
| **FREEZERS** | | | | | | | | | | |
| SFR1-S | 115 | 11.1 | 24.96 | 12.87 | 3 | 1/2 | 1239 | 1629 | 650 | 5-20P |
| SFR2-S | 115 | 14.9 | 51.92 | 27.5 | 6 | 3/4 | 2247 | 3326 | 946 | 5-20P |
| SFR3-S | 115 | 16.0 | 78.89 | 40.5 | 9 | 1 | 3222 | 4253 | 1208 | 14-20P |


**The Delfield Company, P.O. Box 470, Mt. Pleasant, MI 48804-0470, U.S. A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com**



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DSSR 09/01

ITEM # 45

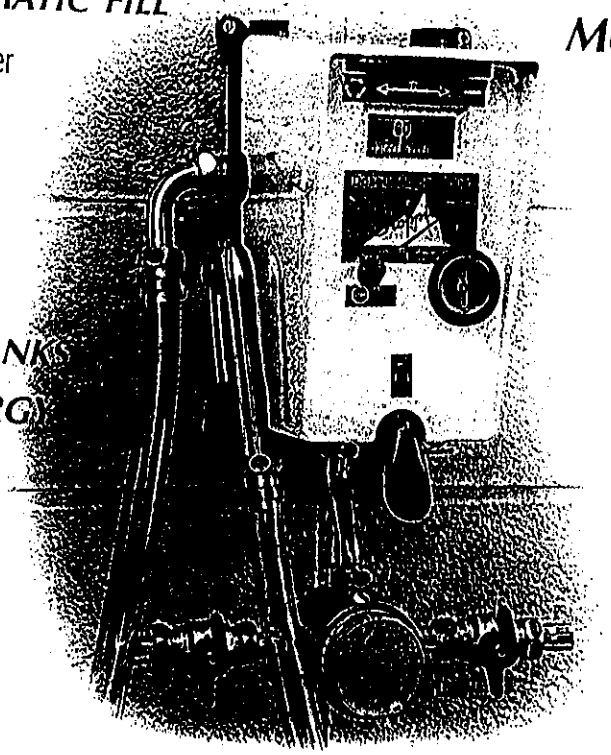
# THE BAKER'S WATER METER

## Kit «Stoppil Plus»

Quality 25 Years Technological Updating

### TIME SAVING THANKS TO AUTOMATIC FILL

Avoids wasting time (no longer reading the volume gauge or using a pail)



### MORE CUSTOMERS THANKS TO AN EXCELLENT DOUGH QUALITY

as very good volume and temperature accuracy

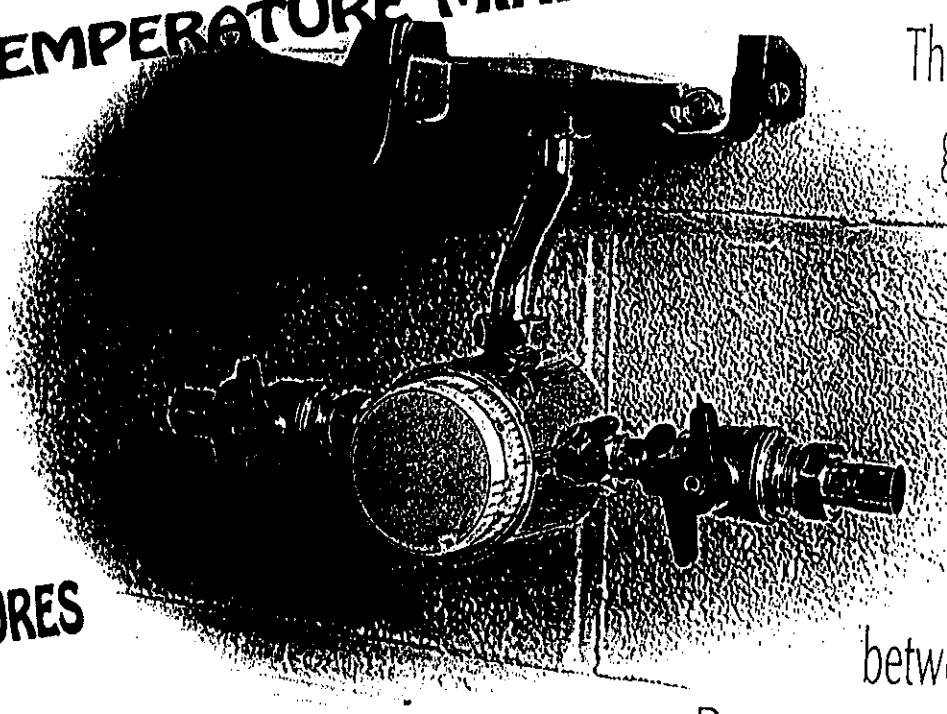
### MORE PROFITS THANKS TO A GAIN OF ENERGY AND MAINTENANCE

Allows the installation of the chiller in a cool place and far from the flour supply avoiding a bad operating of the cooling system

### MORE PRACTICAL

Avoids tiredness and spattering water (by using a pail)

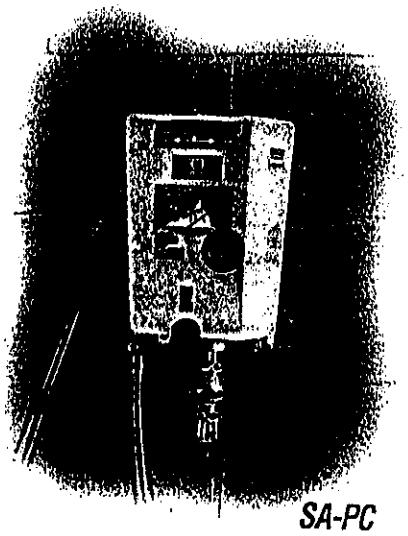
## THE TEMPERATURE MIXING VALVE



SPECIAL LOW TEMPERATURES

The knob with huge graduations by one degree guarantees quick setting and excellent accuracy between 1 and 25 Degrees

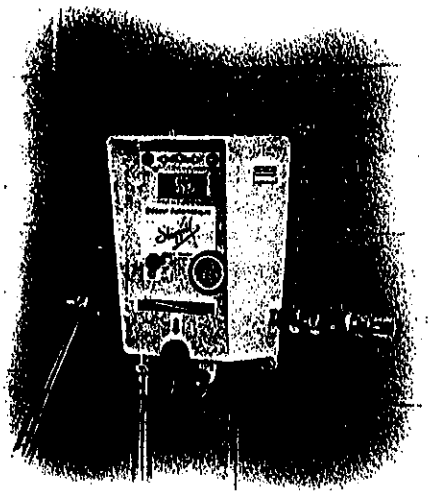
# WHICH STOPPIL WATER METER CHOOSE ?



SA-PC

## DIAL SETTING

Most simple entirely mechanical.
Precise thanks to a click-and-ratchet mechanism every 0,5 L between 10 and 100 L

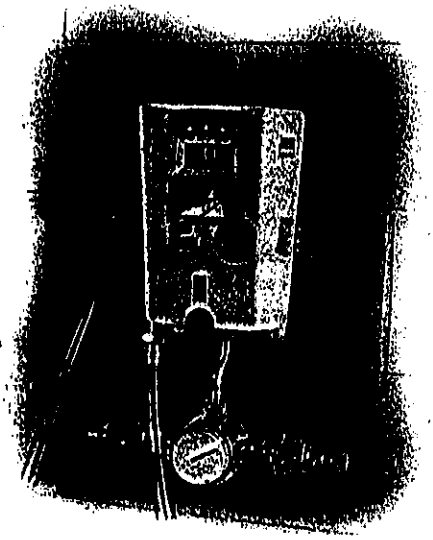


SAMM-PC

## 3 WAYS OF TEMPERATURE MIXING

***SA - Without temperature mixing*** by the water meter but a thermometer indicates the water temperature
To be plugged directly to a chiller
Required water pressure : 0,15 bar min. (1m50 distance between bottom of water storage and water meter)

***SAMM - Manual temperature mixing*** based on the system of a throttle chamber according to hot and cold water temperature .
It is easy to add hot water when starting the dough production
Required water pressure : 0,2 bar min. (2m distance between bottom of water storage and water meter)
For a quicker flow, the water chiller needs a pump or work with tap pressure.



SAMT-PC

***SAMT - Automatic temperature mixing by means of a mixing valve***

The mixing valve fitted to the water inlet allows a very precise temperature setting and an automatic temperature adjustment.

This mixing valve is especially designed for the mixing of very cold water

The knob with huge graduations (by one degree) guarantees very fast setting and very good accuracy.

Required water pressure : 1 bar (10m) minimum for a perfect working.

For chillers with a pump, the water meter requires an electrical contact called microswitch or work with tap pressure.

Studio Tél: (1) 42 39 37 57

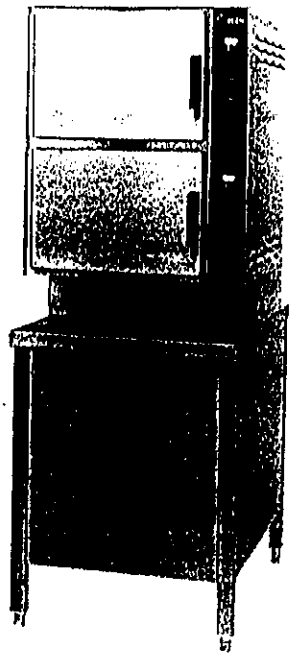
# HY-6G

GROEN

#47

6 Pan Capacity Stainless Steel Pressureless Steamer

With Twin Gas Atmospheric Steam Generators In Cabinet Base



### Description

Steamer shall be a Groen Model HY-6G stainless steel pressureless steamer with twin atmospheric 45,000 BTU/hr gas steam generators, for a total of 90,000 BTU maximum, per bulletin 71 as follows:

### Construction

Steamer cavities and cabinet base shall be all stainless steel construction with removable right side panel providing access to internal components. Steamer doors are all stainless steel with strong continuous hinge and is field reversible for left or right swing. Doors shall be insulated and provided with a one piece, replaceable seal. Easy open handle and latch shall provide positive lock and seal when door is pushed or slammed shut.

Hidden magnetic door switch cuts power to blower and reduces power to generator when the door is opened. Pan support racks shall be electro-polished stainless steel and removable for easy cleaning and to provide access to the steam generator deliming port in each cavity. Wide drip sink with condensate drain is positioned under cavity doors.

21⅝" wide cabinet base shall have stainless steel frame with removable front, side and back panels standard. Cabinet base shall be provided with 6" legs with adjustable bullet feet.

### Finish

Cabinet exterior including door shall be finished to a No. 4 uniform finish. Cavity interiors are electro-polished stainless steel. Control panel face plates shall be smudge resistant polyester film ensuring maximum ease in cleaning and maintaining an attractive appearance.

### C.S.A. Design Certification

Steamer shall be C.S.A. (formerly A.G.A.)design certified to ANSI Z83.11".

### Sanitation

Unit shall be designed and manufactured to meet NSF and known health department and sanitation codes and be NSF listed.

Unit shall allow operator to delime both steam generators through access port in each cavity without tools or service call. Push button auto-clean is standard

### Controls

Steamer cavity controls shall include an ON-OFF power touch pad; 60 minute mechanical timer with continuous steam setting, and READY light which indicates when cavity is ready for steaming. Auto-CLEAN button initiates deliming cycle.

### Performance Features

Each steamer cavity shall have a powerful side-mounted blower, which increases steam velocity and provides efficient steam distribution throughout cavity and between loaded pans. Steam generators deliver approximately 15,000 BTUs/hour input per 2½" deep steam pan.

Heat up time to READY shall be 7-10 minutes or less, under normal conditions. Cavities are kept warm and ready for instant steam between loads. No cavity warmup required after READY light comes on.

SERVICE indicator light warns operator of need to delime steam generator. Unit will shut off if water level is low. When power switch is turned "off", unit automatically blows down the steam generator to reduce sediment build-up.

### Cabinet Base Steam Source

Unit shall have twin gas heated cabinet mounted steam generators to provide atmospheric steam to the chambers at a temperature of approximately 212°F. Each steam generator has an electric low water sensor, a 45,000 BTU/hr firing rate and is 65% efficient. Unit comes standard with standing pilot with electronic ignition system.

### Pan Capacity

| Pan Size | Per Cavity | Total |
|---|---|---|
| 12 x 20 x 1" | 6 | 12 |
| 12 x 20 x 2½" | 3 | 6 |
| 12 x 20 x 4" | 2 | 4 |

### Installation

Unit requires gas service (specify natural or propane) via ½" NPT pipe or approved equivalent. Unit requires 3/4" NH cold water supply line; 1½" free venting drain; and 115 volt single phase, 4 AMP electric service. A second cold water connection is also available as an option for the spray condensor.

### Water Supply Requirements

To minimize service problems a water treatment (softening) system is recommended when water quality is found to exceed limits stated below and in operator manual.

Recommended MINIMUM water quality standards are: Total dissolved solids (TDS) content should have a value of 30 to 40 parts per million, and the water pH should be 7.0 to 9.0.

### Origin of Manufacture

Steamer shall be designed and manufactured in the United States.

### Short Form

Unit shall be a Groen HyPerSteam pressureless steamer Model HY-6G with twin, independent gas heated steam generators mounted in 21⅝" wide cabinet base, per bulletin 71. All stainless steel construction with two steam cavities, each powered by its own independent atmospheric steam generator with powerful blower to circulate steam within cavity and separate operating controls, including: 60 minute mechanical timer, constant steam setting, ready light and CLEAN cycle button to initiate deliming. Simple deliming through port in each cavity. Doors are field reversible, with easy open latch and hidden magnetic door switch, and wide condensate sink with drain is provided under cavity doors. Twin atmospheric steam generators require no pressure gauges or switches, and have 45,000 BTU/hr input each. Unit shall come up to steam in 7-10 minutes from a cold start, and provide true warm cavity instant steam capability. A.G.A. and C.G.A. Design Certified and NSF listed. See other side for gas, electric, water and drain connections required. Made in USA.

### Applications

*Pasta*
*Rice*
*Vegetables (Fresh and Frozen)*
*Seafood (Fresh and Frozen)*
*Poultry*
*Potatoes*
*Eggs*
*Meats*
*Reheat Cook-Chill & Prepared Foods*

A DOVER INDUSTRIES COMPANY

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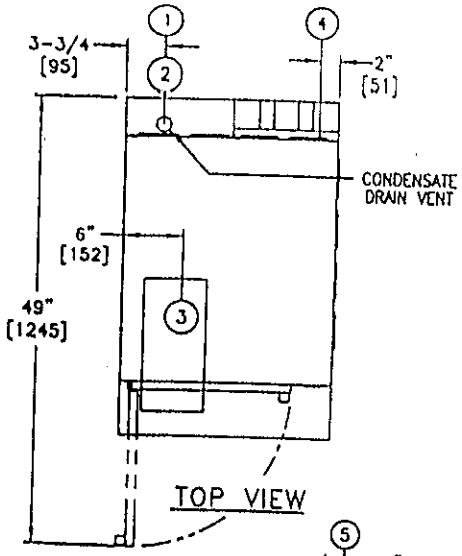
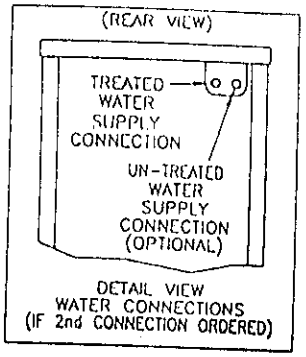
Jackson, Mississippi 39212
Telephone (601) 372-3903
FAX (601) 373-9587

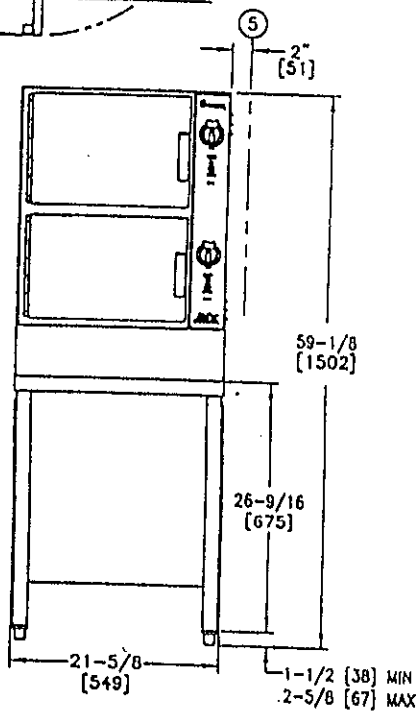



TOP VIEW

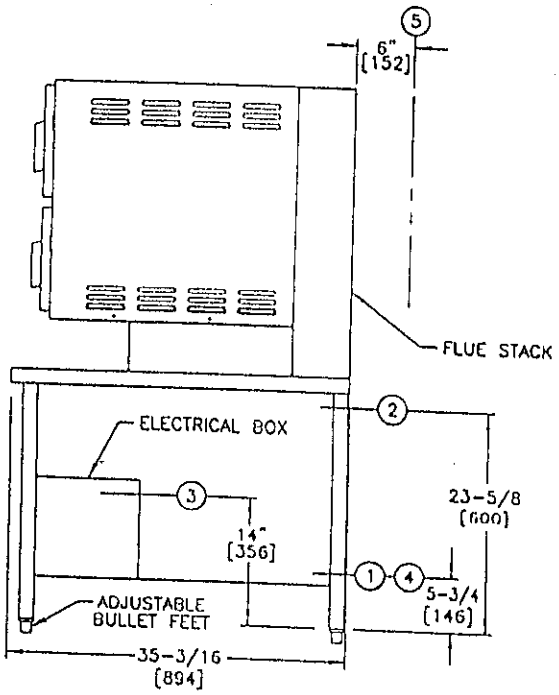



DETAIL VIEW
WATER CONNECTIONS
(IF 2nd CONNECTION ORDERED)

| | NATURAL GAS | PROPANE GAS |
|---|---|---|
| GAS OPERATING PRESSURE | 3.7" W.C. | 10.5" W.C. |
| MAX. INPUT-BTU/HR | 90,000 | 90,000 |
| RECOMMENDED INCOMING GAS FEED RATE | 5"W.C. MIN | 12"W.C. MIN |
| | 14"W.C. MAX | 14"W.C. MAX |




FRONT VIEW




RIGHT SIDE VIEW

## SERVICE CONNECTIONS AND NOTES:

1. DRAIN CONNECTION 1-1/2" TUBE (DRAIN FREE VENTING)
2. COLD WATER SUPPLY AT 30 TO 60 PSIG WITH A MINIMUM FLOW RATE 1.50 GPM AND WITH A 3/4" NH CONNECTION.
3. ELECTRICAL CONNECTION 1" CONDUIT. REQUIREMENTS: 108-126V @ 2.5 AMPS, 60 Hz OR 230V @ 2 AMPS, 50/60 HZ
4. MINIMUM WATER QUALITY STANDARDS ARE: TOTAL DISSOLVED SOLIDS (TDS) CONTENT SHOULD NOT EXCEED 30 PPM AND THE pH LEVEL SHOULD BE 7.0 OR HIGHER.
5. MINIMUM CLEARANCE REQUIRED: REAR = 6" [152], LEFT SIDE = 0" [0], RIGHT SIDE = 2" [51]
6. DIMENSIONS IN BRACKETS [ ] ARE MM.
7. GAS CONNECTION: 1/2 NPT.

P/N 125790 REV B

Telephone 601 372-3903
FAX: 601 373-9587

Due to continual product improvement, designs are subject to change without notice.

# HY-6G

*6 Pan Capacity*
*Stainless Steel*
*Pressureless Steamer*



Revised 5/00

ADVANCE TABCO

STAINLESS STEEL

# HAND SINKS
# TRADITIONAL

#48

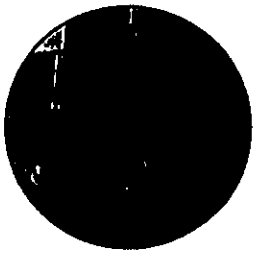
*Item #:* _____

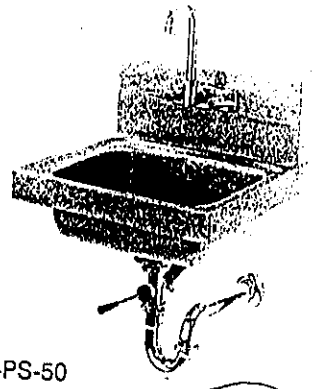
*Model #:* _____

*Project #:* _____

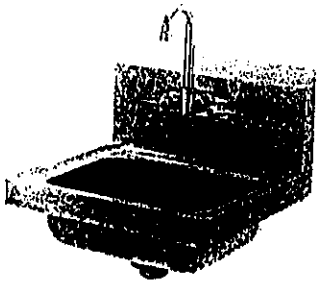
NSF

Keyhole Bracket for easier installation and more stability.

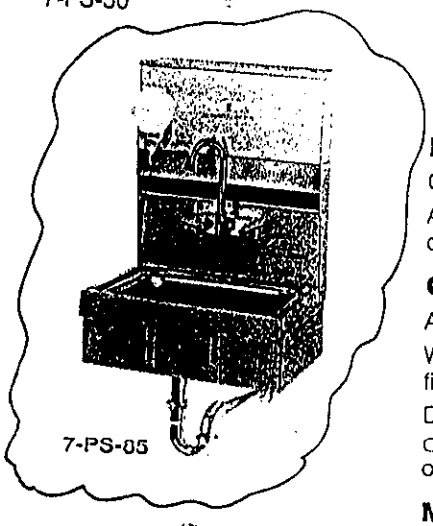




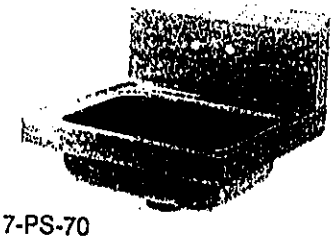
7-PS-50



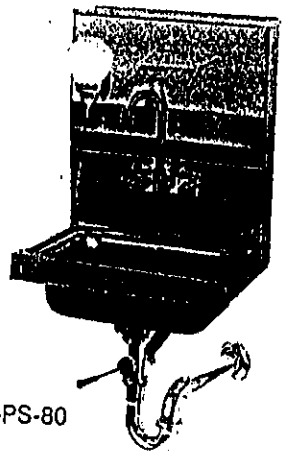
7-PS-60



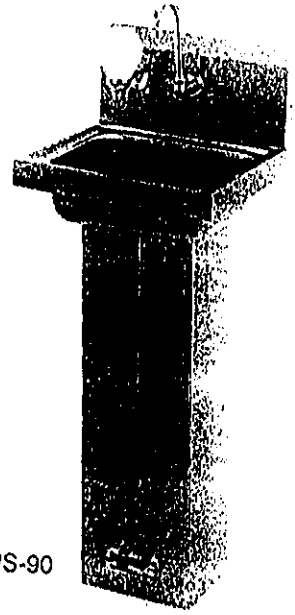
7-PS-65



7-PS-70



7-PS-80



7-PS-90

| Model # | Qty |
|---|---|
| 7-PS-50 | |
| 7-PS-60 | |
| 7-PS-70 | |
| 7-PS-80 | |
| 7-PS-85 | |
| 7-PS-90 | |

## FEATURES:

One piece **Deep Drawn** sink bowl design.

All sink bowls have a large liberal radii with a minimum dimension of 2" and are rectangular in design for increased capacity.

## CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Die formed Countertop Edge with a 3/8" No-Drip offset.

One sheet of stainless steel is used. There are no welded seams other than corners.

## MECHANICAL:

Faucet supply is 1/2" IPS male thread hot and cold.

K-59 splash mounted 4" O.C. gooseneck faucet chrome plated furnished with aerator.

K-6 stainless steel basket drain 1-1/2" IPS.

K-26 lever operated drain and built-in overflow with plastic overflow tube and spring clamps.

7-PS-14 P-Trap is 1 1/2" chrome plated.

7-PS-12 Soap Dispenser.

Towel dispenser with hinged cover. Unit uses standard C-fold towels.

Sink bowl is 10" x 14" x 5".

## MATERIAL:

Heavy gauge type 304 series stainless steel.

Wall mounting bracket is stainless steel and of offset design.

All fittings are brass / nickel plated unless otherwise indicated.


ADVANCE TABCO

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**TEXAS**
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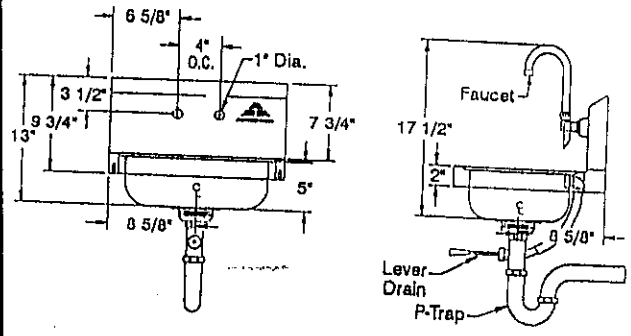
Fax: (972) 932-4795

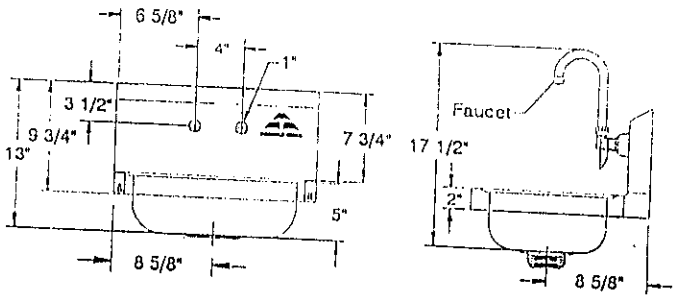
**NEVADA**
(800) 446-8684
Fax: (775) 972-1578

200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com www.advancetabco.com

## 7-PS-50




## 7-PS-60

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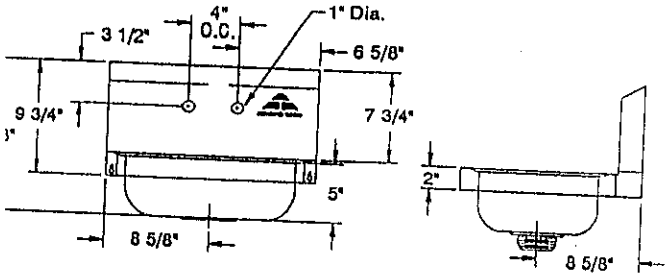


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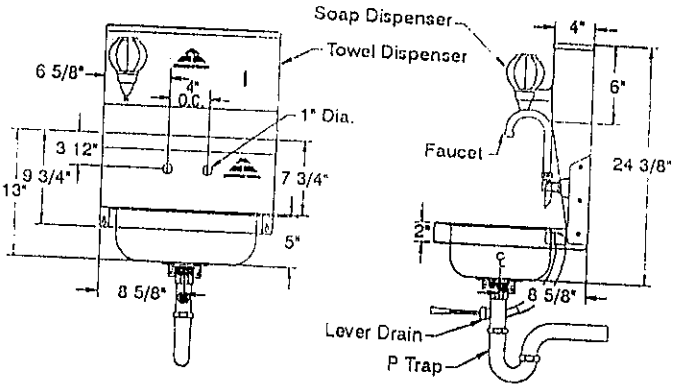
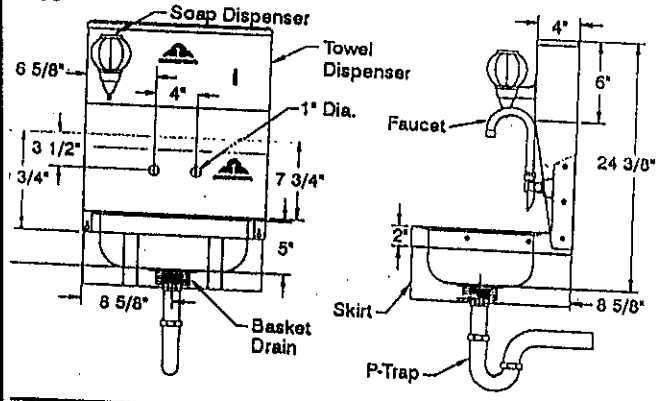
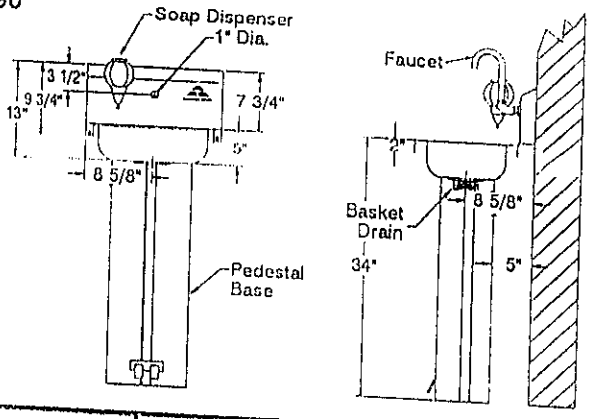


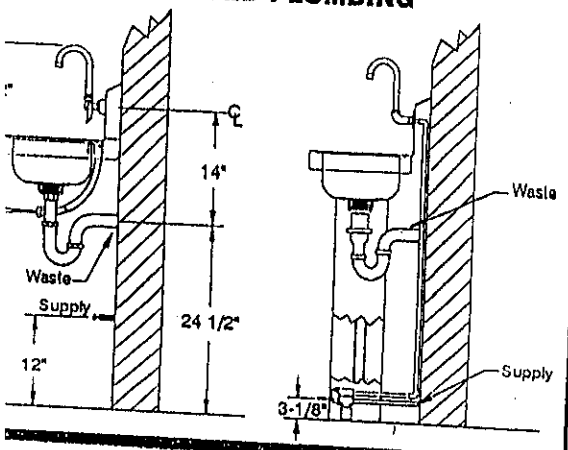

## S-85



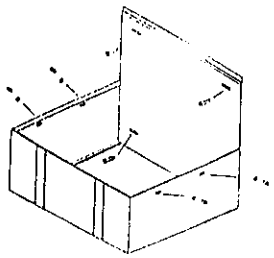

## 7-PS-90



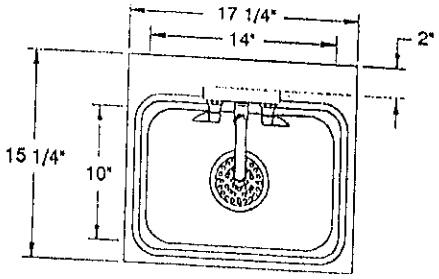

## SUGGESTED PLUMBING




## SKIRT INSTALLATION



## TOP VIEW




TOL ± .500"
ALL DIMENSIONS ARE TYPICAL


ADVANCE TABCO
200 Heartland Boulevard, Edgewood, NY 11717-8380


ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.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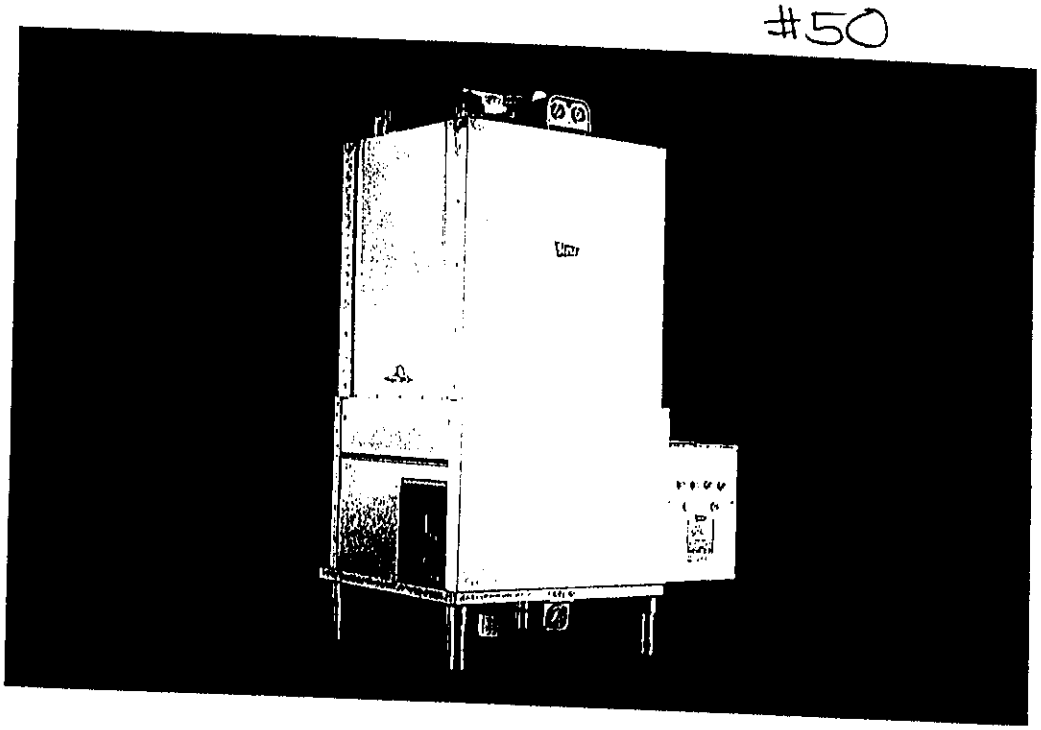
# U-31-A

#50

*Stero's heavy duty single tank pot, pan and utensil washer provides fully automatic and adjustable operation.*



### Large Volume, High-capacity and Automatic

- Convenient door height and width allow for easy entry of even the largest utensils.
- Wash and rinse cycles can be adjusted and manually controlled to handle hard to clean ware.
- High capacity 3 HP pump and motor create a waste stripping wash and rinse pattern.

### Designed for Easy Operation

- Counter balanced doors easily open and close.
- Push through design and stainless steel racks ease washing process.
- Easy to reach mounted control panel offers automatic and manual controls.
- Easy to read temperature gauges monitor all water temperatures.

### Powerful Cleaning Action

- Produces 25 large volume 24 x 28 inch racks of clean and sanitized ware per hour.
- Revolving upper and lower wash arms direct 180 gallons of highly concentrated spray over the ware every minute.
- Thoroughly sanitizes with 180 degree final rinse that also enables the ware to dry quickly.
- Automatic wash and rinse cycles can be bypassed with manual controls to eliminate hard to remove soil.

### Standard Safety Features

- Door safety switch will prevent the machine from running unless the doors are fully closed.

### Standard Equipment Engineered for the End User

- Type 304, 18-8, #4 stainless steel tank and hood.
- Stainless steel frame and legs.
- Enclosed adjustable stainless steel feet.
- Stainless steel front enclosure panel.
- Rack complement includes stainless steel racks: one basket rack, one general utility rack, one counter pan rack and one bun pan rack.
- Stainless steel strainer pans filter wash and rinse water.
- 3 HP, drip-proof motor has overload protection, extended stainless steel shaft, sealed ball bearings and manual reset buttons.

Complete internal plumbing and wiring.

### Tank Heat Options

Electric tank heat, thermostatically controlled with low water cut-off.

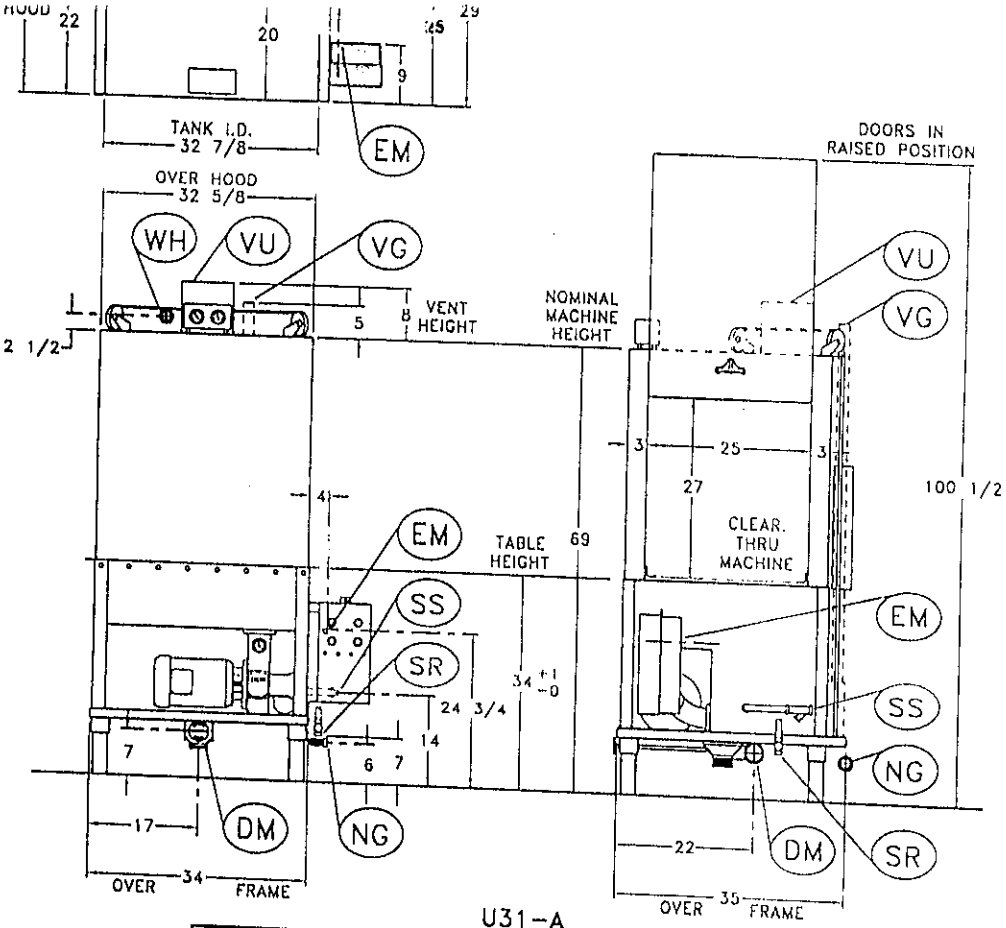
- Steam injector, thermostatically controlled and equipped with a steam silencer and low water cut-off.
- Steam coils, thermostatically controlled, provide for a completely closed heating system and is equipped with low water cut-off.
- Infrared gas tank heat thermostatically controlled and equipped with low water cut-off.

### Miscellaneous

- Auto Fill provides automatic initial fill.
- Kit #55, a pre-plumbed and installed plumbing kit that includes a pressure regulating valve, pressure gauge and shock arrester.
- U-31-A-C space saving corner operating machine can be ordered at extra cost.

Stero

The Stero Company
3200 Lakeville Highway ■ Petaluma, CA 94954-5675
■ Toll Free 800-762-7600




U31-A

| CONNECTION POINTS | | |
|---|---|---|
| DM | 2" NPT (F) | DRAIN, MACHINE WASTE: |
| WH | 3/4" NPT (F) | WATER SUPPLY: 180°F. @ 20 PSI FLOW PRESSURE, TANK FILL & FINAL RINSE CONSUMPTION = 70 GALS/HR. |
| SS | 3/4" NPT (F) | STEAM SUPPLY: 15-40 PSI, CONSUMP. @ 20 PSI TANK HEAT = 57 LBS/HR. |
| SR | 1/2" NPT (F) | STEAM RETURN: |
| EM | ELEC. REQ. | ONE (1) FEEDER SIZED FOR: 1. WASH PUMP MOTOR-------3 HP 2. WASH TANK HEAT--------10 KW |
| VU | 7 7/8" SQ. VENT I.D. | VENT: RECOMMENDED MIN. DRAW = 600 CFM |
| VG | 1 5/8 O.D. PIPE | VENT, NATURAL GAS FLUE: VENT TO ATMOSPHERE W/AIR GAP |
| NG | 1/2" NPT (F) | NATURAL GAS SUPPLY: CONSUMPTION = 46,000 BTU/HR. |

WHEN GAS TANK HEAT SPECIFIED
SS, SR, AND 10 KW TANK HEAT NOT REQUIRED

STANDARD 208V./230V./480V.-3PH. AVAILABLE
CONTACT FACTORY FOR 1PH. OR 50HZ. APPLICATIONS


The Stero Company
3200 Lakeville Hwy., Petaluma, CA 94954-5675
TEL # (707) 762-0071 TELE-FAX # (707) 762-5036
TOLL FREE (800) 762-7600


Rev. 3/96

# Booster Heater Sizing Chart

#150

800-446-8433

| DISHWASHER / MODEL NUMBER | ELECTRIC COMPACT BOOSTER Temperature Rise | | ELECTRIC IMPERIAL BOOSTER Temperature Rise | | GAS POWERMITE™ BOOSTER▲ Temperature Rise | |
|---|---|---|---|---|---|---|
| **INSINGER** | 40°F. | 70°F. | 40°F. | 70°F. | 40°F. | 70°F. |
| Commander 18-5, 18-5H, Ensign 40-2 | C-6 | C-12 | S-6 | S-12 | PMG-60 | PMG-100 |
| Admiral 44-4, 66-4 | C-24 | C-36 | S-24 | S-39 | PMG-100 | PMG-200 |
| Speeder 64, 86-3, Century (all) | C-24 | C-45 | S-24 | S-45 | PMG-100 | PMG-200 |
| Trac 321, Trac 321-2/RPW | C-27 | C-45 | S-27 | S-45 | PMG-100 | PMG-200 |
| Trac 878 | C-24 | C-36 | S-24 | S-36 | PMG-100 | PMG-200 |
| Clipper (all), R106-2, Super 106-2 | C-27 | C-45 | S-27 | S-45 | PMG-100 | PMG-200 |
| Defender | C-36 | C-54 | S-36 | S-54 | PMG-200 | |
| Master (all) | C-36 | C-58 | S-36 | S-58 | PMG-200 | |
| CA-3 | | | S-9 | S-24 | PMG-200 | |
| DA-3 | | | (2)S-9 | (2)S-24 | | |
| For outdated models, consult factory for correct booster. | | | | | | |
| **JACKSON** | 40°F. | 70°F. | 40°F. | 70°F. | 40°F. | 70°F. |
| JP-24, JP-24B, JP-24F, JP-24BF | C-4 | C-6 | S-6 | S-6 | PMG-60 | PMG-60 |
| 24B Series | | C-4 | | S-6 | | PMG-60 |
| 10AB, 10APRB | | C-5 | | S-6 | | PMG-60 |
| 44CE*, 66 CERPW | C-30 | C-54 | S-30 | S-54 | PMG-200 | |
| 54CE, 76 CERPW | C-36 | (2)C-30 | S-36 | (2)S-30 | PMG-200 | |
| 64CE, 86 CERPW | C-27 | C-39 | S-27 | S-39 | PMG-200 | |
| 100 | C-12 | C-24 | S-12 | S-24 | PMG-100 | |
| 100B, 100PRB, 150B, 150PRB | | C-9 | | S-9 | | |
| 150 | C-12 | C-18 | S-12 | S-18 | | PMG-100 |
| 200 | C-7 | C-12 | S-7 | S-12 | PMG-60 | PMG-60 |
| 200B | | C-6 | | S-6 | | PMG-60 |
| Tempstar, Tempstar SDS, Tempstar HH | C-6 | C-12 | S-6 | S-12 | | |
| AJ-44, AJ-66, AJ-80, WH-44, ES-4400, ES-6600 (ECOLAB/JACKSON) | C-24 | C-45 | S-24 | S-45 | PMG-100 | PMG-200 |
| AJ-54, AJ-76, AJ-90 | C-36 | (2)C-36 | S-36 | (2)S-36 | PMG-200 | |
| AJ-64, AJ-86, AJ-100 | C-24 | C-39 | S-24 | S-39 | PMG-100 | PMG-200 |
| *Model #44CE w/SN1999 or below requires larger booster than listed. | | | | | | |
| **KNIGHT EQUIPMENT LTD.** | 40°F. | 70°F. | 40°F. | 70°F. | 40°F. | 70°F. |
| KLE-112-HL | C-7 | C-12 | S-7 | S-12 | PMG-60 | PMG-60 |
| **METALWASH/INTEDGE** | 40°F. | 70°F. | 40°F. | 70°F. | 40°F. | 70°F. |
| FW4 | C-12 | C-18 | S-12 | S-18 | PMG-60 | PMG-100 |
| RS-30A, RS-28L | | | S-15 | S-24 | | |
| RT-74, RT-60, RT-42B, RT-42BC | | | S-27 | S-40 | | |
| RS-2R | | | S-30 | S-45 | | |
| **STERO** | 40°F. | 70°F. | 40°F. | 70°F. | 40°F. | 70°F. |
| SF-1RA, SC20-1 | C-7 | C-12 | S-7 | S-12 | PMG-60 | |
| SF-2RA, SF-2DRA, SD-2RA, SDRA, SDRA-PACK | C-12 | C-18 | S-12 | S-18 | PMG-60 | PMG-100 |
| SCT-44, SCT-44-10, SCT-54, SCT-76S, SCT-76SC, SCT-76SM | C-36 | C-58 | S-36 | S-58 | PMG-200 | (2)PMG-200 |
| SCT-64, SCT-76, SCT-80, SCT-94, SCT-108, SCT-120, SCT-94S, SCT-108S, SCT-120S, SCT-94SC, SCT-108SC, SCT-120SC, ~~SCT-94SM, SCT-120SM, SCT-160SM~~ | | | | | | |
| U-31-A, U-31-AC | C-45 | C-58 | S-45 | S-58 | PMG-200 | (2)PMG-200 |
| U-31-A2, STPCW-15, STPCW-19, STPCW-19PS, STPCW-20, STPCW-22, STPCW-24 | | | S-18 | S-36 | PMG-100 | PMG-200 |
| STPCW-12PS, STPCW-15PS | C-45 | (2)C-36 | S-45 | (2)S-36 | PMG-200 | (2)PMG-200 |
| STPC-12PS, STPC-15S | C-58 | (2)C-54 | S-58 | (2)S-54 | PMG-200/100 | |
| STPC-15, STPC-19, STPC-19S, STPC-20, STPC-22, STPC-24 | C-54 | (2)C-40 | S-54 | (2)S-40 | PMG-200/100 | (2)PMG-200 |
| STBUW-14 | C-36 | (2)C-30 | S-36 | (2)S-30 | PMG-200 | PMG-200/100 |
| SC-2-4, SC-6-4, SC-1-2-4, SC-1-6-4, SC-5-6-4, SC-5-2-4 | C-58 | (2)C-54 | S-58 | (2)S-54 | | |
| SC-2-3-4, SC-6-3-4, SC-2-7-4, SC-1-2-7-4, SC-1-6-3-4, SC-5-2-3-4, SC-1-6-7-4, SC-5-6-3-4, SC-5-2-7-4 | C-36 | C-58 | S-36 | S-58 | PMG-200 | |
| SC20-2 | C-30 | (2)C-27 | S-30 | (2)S-27 | PMG-200 | |
| SC-2-8, SC-2-9, SC-1-2-8, SC-5-6-8, SC-6-8, SC-6-9, SC-1-6-8, SC-5-6-9, SC-5-2-9, SC-1-6-9, SC-5-2-8 | C-12 | C-24 | S-12 | S-24 | | PMG-100 |
| | C-18 | C-36 | S-18 | S-36 | PMG-100 | PMG-200 |

▲ Powermite installations above 2,000 ft. will reduce the above capacities and may require orifice changes to meet IAS safety compliance. Consult "Installation and Operating Manual" for sizing adjustments and orifice changes.

This selector chart is based on 40°F. and 70°F. temperature rises, 20 psi flow pressure and minimum rinse cycle timer setting in NSF listing.

All booster heaters are rated at 100% of the capacity of the dishwashers as recommended by the National Sanitation Foundation. Where make up water for wash tank is provided from final rinse supply, chart recommendations are based upon this additional demand (not over 2 GPM) as required by NSF.

All sizings shown are that of the dishwasher manufacturers. Hatco Corporation is not responsible for incorrect sizing applications.

**SIZING CALCULATION**

RULE OF THUMB FOR HATCO ELECTRIC BOOSTER WATER HEATERS: $\frac{GPH}{10}$ = kW 40°F. rise

Hatco®

*JANUARY 1, 2002*
*DIRECT LINE EQUIPMENT ORDERS AND INQUIRIES*
*(800) 4-HOT IDEAS*
*(800-446-8433)*

ITEM# #50c

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58

The Hatco Imperial Electric Booster Water Heater combines quality construction and rugged dependability to provide up to 600 GPH (2300 LPH) of sanitizing rinse water. Dishes and flatware *air-dry* instantly to save time, space and money. Storage capacity is 16 gallons (60 liters).

## FLEXIBILITY

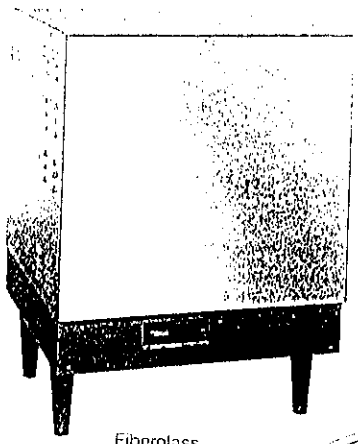
Models available from 6kW to 58.5kW in 208, 240 and 480 volts with other voltages available. The Imperial Electric Booster Heater thermostats can be lowered to a 140°F (60°C) setting for low-temp dishmachines.

Service area is accessible from the front to permit easy installation, even next to other equipment.

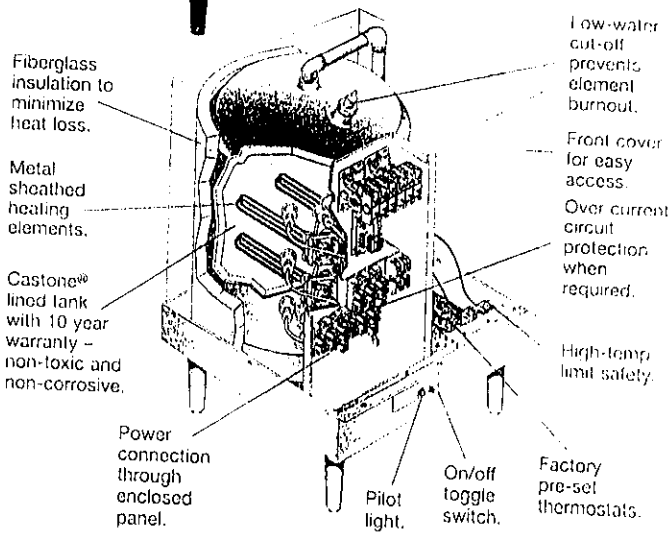
## QUALITY

The following features assure the finest performance for years to come.

- All models include a Castone® lined tank with a 10 year limited warranty.
- Features include a temperature/pressure relief valve, a cast iron pressure reducing valve, two temperature/pressure gauges, a high temperature limit control, pilot indicator light, on-off switch and a low water cut-off to prevent element burnout due to low water condition.
- Each booster has a built-in heat trap and fiberglass insulation to minimize heat loss.
- Low water protection prevents heating element burnout, and alerts operator to low water condition.
- Hatco electric booster heaters are factory pre-plumbed and pre-wired with calibrated immersion thermostats and high temperature limit switch.
- A stainless steel front panel and powder coated silver gray hammertone body is standard on all Imperial models.



Model S-54




Water Temperature Recovery Table

| Imperial Model | 40°F (22°C) Rise | 70°F (39°C) Rise |
|---|---|---|
| S-6 | 60 gph ( 227 lph) | 34 gph ( 129 lph) |
| S-7 | 70 gph ( 265 lph) | 40 gph ( 151 lph) |
| S-9 | 90 gph ( 341 lph) | 52 gph ( 197 lph) |
| S-12 | 120 gph ( 454 lph) | 69 gph ( 261 lph) |
| S-13 | 135 gph ( 511 lph) | 77 gph ( 292 lph) |
| S-15 | 151 gph ( 572 lph) | 86 gph ( 326 lph) |
| S-17 | 173 gph ( 655 lph) | 99 gph ( 375 lph) |
| S-18 | 181 gph ( 685 lph) | 103 gph ( 390 lph) |
| S-24 | 241 gph ( 912 lph) | 138 gph ( 522 lph) |
| S-27 | 271 gph (1026 lph) | 155 gph ( 587 lph) |
| S-30 | 301 gph (1139 lph) | 172 gph ( 651 lph) |
| S-36 | 361 gph (1367 lph) | 206 gph ( 780 lph) |
| S-39 | 391 gph (1480 lph) | 224 gph ( 848 lph) |
| S-40 | 407 gph (1541 lph) | 232 gph ( 878 lph) |
| S-45 | 452 gph (1711 lph) | 258 gph ( 977 lph) |
| S-54 | 542 gph (2052 lph) | 310 gph (1174 lph) |
| S-58 | 588 gph (2226 lph) | 335 gph (1268 lph) |

## WATER QUALITY REQUIREMENTS

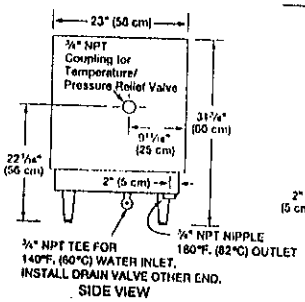
Incoming water in excess of 3.0 grains of hardness per gallon (GPH) (.75 grains of hardness per liter) must be treated and softened before being supplied to booster heater(s). Water containing over 3.0 GPH (.75 GPL) will decrease the efficiency and reduce the operating life of the unit.
*Note: Product failure caused by liming or sediment buildup is not covered under warranty.*

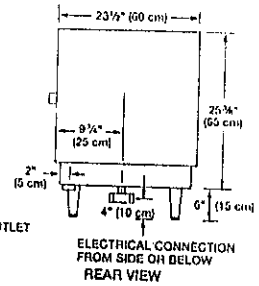

HATCO CORPORATION P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A.
(800) 558-0607 • (414) 671-6350 • Fax (800) 543-7521 • Int'l. Fax (414) 671-

ITEM#

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58




## DIMENSIONS

23½"L x 23"W x 31¾"H with 6" (15 cm) legs (60 x 58 x 80 cm).

Working Pressure of Tanks: 150 psi (1034 kPa) – tested at 300 psi (2069 kPa).

## VOLTAGE

208, 240 and 480 volts available. Export voltages available.

## SPECIFICATIONS

| Model | kW | Volts | 1-Phase Amps | 1-Phase Breaker/ Fuse Size | 3-Phase Amps | 3-Phase Breaker/ Fuse Size | Shipping Weight |
|---|---|---|---|---|---|---|---|
| S-6* | 6 | 208 | 29 | 40 | 25* | 40 | 200 lbs. (91 kg) |
| | | 240 | 25 | 40 | 22* | 30 | |
| | | 480 | – | – | 11* | 15 | |
| S-7* | 7 | 208 | 34 | 50 | 29* | 40 | 200 lbs. (91 kg) |
| | | 240 | 29 | 40 | 25* | 40 | |
| | | 480 | – | – | 13* | 20 | |
| S-9* | 9 | 208 | 43 | 60 | 38* | 50 | 200 lbs. (91 kg) |
| | | 240 | 38 | 50 | 33* | 50 | |
| | | 480 | – | – | 16* | 20 | |
| S-12 | 12 | 208 | 58 | 90 | 33 | 50 | 200 lbs. (91 kg) |
| | | 240 | 50 | 70 | 29 | 40 | |
| | | 480 | – | – | 14.5 | 20 | |
| S-13 | 13.5 | 208 | 65 | 90 | 38 | 50 | 200 lbs. (91 kg) |
| | | 240 | 56.3 | 90 | 33 | 50 | |
| | | 480 | – | – | 16.3 | 30 | |
| S-15 | 15 | 208 | 72 | 90 | 41.7 | 60 | 200 lbs. (91 kg) |
| | | 240 | 62.5 | 90 | 36.1 | 50 | |
| | | 480 | – | – | 18.1 | 30 | |
| S-17† | 17.2 | 208 | – | – | 47.9 | 60 | 200 lbs. (91 kg) |
| S-18§ | 18 | 208 | 86.5 | 125 | – | – | 200 lbs. (91 kg) |
| | | 240 | 75 | 100 | 43.4 | 60 | |
| | | 480 | – | – | 21.7 | 30 | |
| S-24 | 24 | 208 | 115.4 | 150 | 67.7 | 90 | 214 lbs. (97 kg) |
| | | 240 | 100 | 125 | 57.8 | 90 | |
| | | 480 | – | – | 29.9 | 40 | |
| S-27 | 27 | 208 | 129.8 | 175 | 75 | 100 | 214 lbs. (97 kg) |
| | | 240 | 112.5 | 150 | 65 | 90 | |
| | | 480 | – | – | 32.5 | 50 | |

| Model | kW | Volts | 1-Phase Amps | 1-Phase Breaker/ Fuse Size | 3-Phase Amps | 3-Phase Breaker/ Fuse Size | Shipping Weight |
|---|---|---|---|---|---|---|---|
| S-30 | 30 | 208 | 144 | 200 | 83.3 | 125 | 214 lbs. ( 97 kg) |
| | | 240 | 125 | 175 | 72.3 | 100 | |
| | | 480 | | | 36 | 50 | |
| S-36 | 36 | ~~208~~ | ~~173~~ | ~~225~~ | ~~100~~ | ~~125~~ | 214 lbs. ( 97 kg) |
| | | ~~240~~ | ~~150~~ | ~~200~~ | ~~86.7~~ | ~~125~~ | |
| | | 480 | – | – | 43.3 | 60 | |
| S-39 | 39 | 208 | 187.5 | 250 | 108 | 150 | 214 lbs. ( 97 kg) |
| | | 240 | 163.5 | 225 | 94 | 125 | |
| | | 480 | – | – | 47 | 60 | |
| S-40 | 40.5 | 208 | – | – | 112 | 150 | 224 lbs. (102 kg) |
| | | 240 | – | – | 97 | 125 | |
| | | 480 | – | – | 49 | 60 | |
| S-45* | 45 | 208 | – | – | 125 | 175 | 224 lbs. (102 kg) |
| | | 240 | 188 | 250 | 108 | 150 | |
| | | 480 | – | – | 54 | 70 | |
| S-54** | 54 | 208 | – | – | 150 | 200 | 224 lbs. (102 kg) |
| | | 240 | – | – | 130 | 175 | |
| | | 480 | | | 65 | 90 | |
| S-58** | 58.5 | 208 | – | – | 162.5 | 225 | 224 lbs. (102 kg) |
| | | 240 | – | – | 141 | 200 | |
| | | 480 | – | – | 71 | 90 | |

* Only 6, 7 & 9kW Models, 208 and 240 volts only, can be field converted to single phase (units are shipped 3-phase open delta). Larger branch circuit required than for balanced 3-phase of equal kW. (Balanced 3-phase available, consult factory.)
† 17.2kW Models available in 208v 3-phase only.
§ 18kW Models not available in 208v 3-phase.
* Not available in 208v single phase.
** Not available in 208v or 240v single phase.

## OPTIONS (NOT FOR RETROFIT)

- ❑ All Stainless Steel Body and Base

## ACCESSORIES

- ❑ Blended Phosphate Water Treatment System
- ❑ Shock Absorber – To Reduce Water Hammer
- ❑ Brass Pressure Reducing Valve with By-Pass
- ❑ Floor Mounting Hardware
- ❑ Adjustable Stainless Steel Legs 6" to 8" (15 to 20 cm)

## ARCHITECT SPECS

### Electric Booster Water Heaters

The Electric Booster Water Heater to supply the final 180°F (82°C) rinse for the dishwasher shall be a Hatco ....Model No. ....as manufactured for commercial use by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The booster shall have the capacity to heat ....gph (lph) from ....°F to 180°F (....°C to 82°C) and it shall be rated at ....kW, ....volts, ....phase. The tank shall be designed for a working pressure of 150 psi (1034 kPa) and include a Hatco Castone® lining.

The heater shall be complete with all internal plumbing, including ¾" NPT pipe and fittings for inlet and outlet. All controls shall be built-in, including contactors and prewired in accordance with UL #1453 and NEC 422-27. Proper surface mounting circuit breaker or fused disconnect switch shall be provided by electrical contractor.

Electric heating elements shall be metal sheathed, controlled by close tolerance immersion thermostats. The booster shall be protected with high temperature limit switch (ECO) and low water cut-off.

The heater shall consist of stainless steel front and silver gray hammertone body with standard 6" (15 cm) legs (or stainless steel body, base and stainless steel adjustable legs).

The heater shall include a temperature/pressure relief valve, high-temperature pressure reducing valve with bypass, indicating temperature/pressure gauges and shock absorber.


**HATCO CORPORATION P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. • (800) 558-0607 • (414) 671-6350**
**Fax (800) 543-7521 • Int'l. Fax (414) 671-3976 • Web Site: www.hatcocorp.com • E-mail: equipsales@hatcocorp.com**

ITEM#

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58

#51a

CAN WASH

The Hatco Imperial Electric Booster Water Heater combines quality construction and rugged dependability to provide up to 600 GPH (2300 LPH) of sanitizing rinse water. Dishes and flatware *air-dry* instantly to save time, space and money. Storage capacity is 16 gallons (60 liters).

## FLEXIBILITY

Models available from 6kW to 58.5kW in 208, 240 and 480 volts with other voltages available. The Imperial Electric Booster Heater thermostats can be lowered to a 140°F (60°C) setting for low-temp dishmachines.

Service area is accessible from the front to permit easy installation, even next to other equipment.

## QUALITY

The following features assure the finest performance for years to come.

- All models include a Castone® lined tank with a 10 year limited warranty.
- Features include a temperature/pressure relief valve, a cast iron pressure reducing valve, two temperature/pressure gauges, a high temperature limit control, pilot indicator light, on-off switch and a low water cut-off to prevent element burnout due to low water condition.
- Each booster has a built-in heat trap and fiberglass insulation to minimize heat loss.
- Low water protection prevents heating element burnout, and alerts operator to low water condition.
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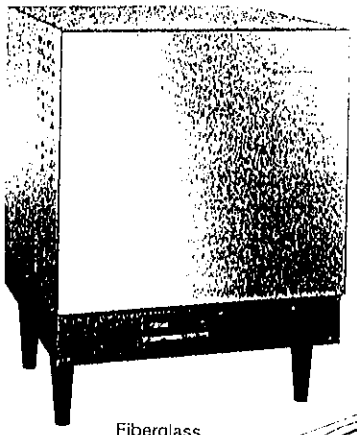
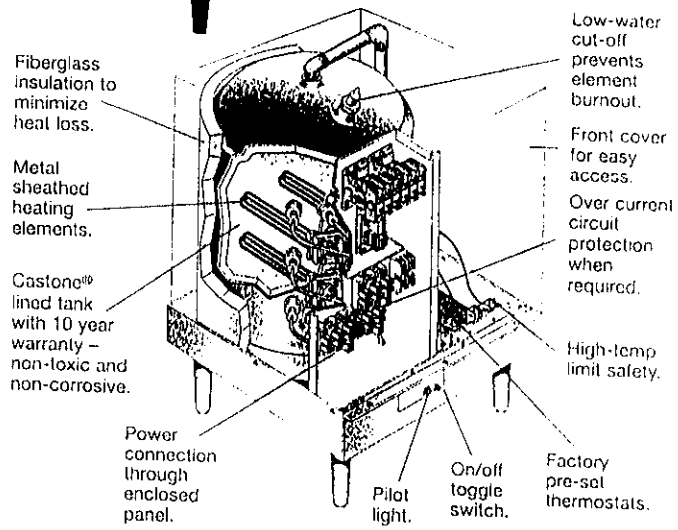
- A stainless steel front panel and powder coated silver gray hammertone body is standard on all Imperial models.



Model S-54




Water Temperature Recovery Table

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| S-9 | 90 gph ( 341 lph) | 52 gph ( 197 lph) |
| S-12 | 120 gph ( 454 lph) | 69 gph ( 261 lph) |
| S-13 | 135 gph ( 511 lph) | 77 gph ( 292 lph) |
| S-15 | 151 gph ( 572 lph) | 86 gph ( 326 lph) |
| S-17 | 173 gph ( 655 lph) | 99 gph ( 375 lph) |
| S-18 | 181 gph ( 685 lph) | 103 gph ( 390 lph) |
| S-24 | 241 gph ( 912 lph) | 138 gph ( 522 lph) |
| S-27 | 271 gph (1026 lph) | 155 gph ( 587 lph) |
| S-30 | 301 gph (1139 lph) | 172 gph ( 651 lph) |
| S-36 | 361 gph (1367 lph) | 206 gph ( 780 lph) |
| S-39 | 391 gph (1480 lph) | 224 gph ( 848 lph) |
| S-40 | 407 gph (1541 lph) | 232 gph ( 878 lph) |
| S-45 | 452 gph (1711 lph) | 258 gph ( 977 lph) |
| S-54 | 542 gph (2052 lph) | 310 gph (1174 lph) |
| S-58 | 588 gph (2226 lph) | 335 gph (1268 lph) |

## WATER QUALITY REQUIREMENTS

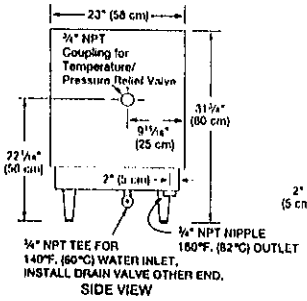
Incoming water in excess of 3.0 grains of hardness per gallon (GPH) (.75 grains of hardness per liter) must be treated and softened before being supplied to booster heater(s). Water containing over 3.0 GPH (.75 GPL) will decrease the efficiency and reduce the operating life of the unit.
*Note: Product failure caused by liming or sediment buildup is not covered under warranty.*

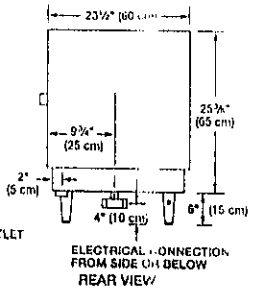

HATCO CORPORATION P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A.
(800) 558-0607 • (414) 671-6350 • Fax (800) 543-7521 • Int'l. Fax (414) 671-3976
Web Site: www.hatcocorp.com • E-mail: [illegible]

ITEM#

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58




## DIMENSIONS

23½"L x 23"W x 31⅜"H with 6" (15 cm) legs (60 x 58 x 80 cm).

Working Pressure of Tanks: 150 psi (1034 kPa) – tested at 300 psi (2069 kPa).

## VOLTAGE

208, 240 and 480 volts available. Export voltages available.

## SPECIFICATIONS

| | | | 1-Phase | | 3-Phase | | |
|---|---|---|---|---|---|---|---|
| Model | kW | Volts | Amps | Breaker/ Fuse Size | Amps | Breaker/ Fuse Size | Shipping Weight |
| S-6* | 6 | 208 | 29 | 40 | 25* | 40 | 200 lbs. (91 kg) |
| | | 240 | 25 | 40 | 22* | 30 | |
| | | 480 | – | – | 11* | 15 | |
| S-7* | 7 | 208 | 34 | 50 | 29* | 40 | 200 lbs. (91 kg) |
| | | 240 | 29 | 40 | 25* | 40 | |
| | | 480 | – | – | 13* | 20 | |
| S-9* | 9 | 208 | 43 | 60 | 38* | 50 | 200 lbs. (91 kg) |
| | | 240 | 38 | 50 | 33* | 50 | |
| | | 480 | – | – | 16* | 20 | |
| S-12 | 12 | 208 | 58 | 90 | 33 | 50 | 200 lbs. (91 kg) |
| | | 240 | 50 | 70 | 29 | 40 | |
| | | 480 | – | – | 14.5 | 20 | |
| S-13 | 13.5 | 208 | 65 | 90 | 38 | 50 | 200 lbs. (91 kg) |
| | | 240 | 56.3 | 90 | 33 | 50 | |
| | | 480 | – | – | 16.3 | 30 | |
| S-15 | 15 | ~~208~~ | ~~72~~ | ~~90~~ | ~~41.7~~ | ~~60~~ | 200 lbs. (91 kg) |
| | | ~~240~~ | ~~62.5~~ | ~~90~~ | ~~36.1~~ | ~~50~~ | |
| | | 480 | – | – | 18.1 | 30 | |
| S-17† | 17.2 | 208 | – | – | 47.9 | 60 | 200 lbs. (91 kg) |
| S-18§ | 18 | 208 | 86.5 | 125 | – | – | 200 lbs. (91 kg) |
| | | 240 | 75 | 100 | 43.4 | 60 | |
| | | 480 | – | – | 21.7 | 30 | |
| S-24 | 24 | 208 | 115.4 | 150 | 67.7 | 90 | 214 lbs. (97 kg) |
| | | 240 | 100 | 125 | 57.8 | 90 | |
| | | 480 | – | – | 29.9 | 40 | |
| S-27 | 27 | 208 | 129.8 | 175 | 75 | 100 | 214 lbs. (97 kg) |
| | | 240 | 112.5 | 150 | 65 | 90 | |
| | | 480 | – | – | 32.5 | 50 | |

| | | | 1-Phase | | 3-Phase | | |
|---|---|---|---|---|---|---|---|
| Model | kW | Volts | Amps | Breaker/ Fuse Size | Amps | Breaker/ Fuse Size | Shipping Weight |
| S-30 | 30 | 208 | 144 | 200 | 83.3 | 125 | 214 lbs. ( 97 kg) |
| | | 240 | 125 | 175 | 72.3 | 100 | |
| | | 480 | – | – | 36 | 50 | |
| S-36 | 36 | 208 | 173 | 225 | 100 | 125 | 214 lbs. ( 97 kg) |
| | | 240 | 150 | 200 | 86.7 | 125 | |
| | | 480 | – | – | 43.3 | 60 | |
| S-39 | 39 | 208 | 187.5 | 250 | 108 | 150 | 214 lbs. ( 97 kg) |
| | | 240 | 163.5 | 225 | 94 | 125 | |
| | | 480 | – | – | 47 | 60 | |
| S-40 | 40.5 | 208 | – | – | 112 | 150 | 224 lbs. (102 kg) |
| | | 240 | – | – | 97 | 125 | |
| | | 480 | – | – | 49 | 60 | |
| S-45* | 45 | 208 | – | – | 125 | 175 | 224 lbs. (102 kg) |
| | | 240 | 188 | 250 | 108 | 150 | |
| | | 480 | – | – | 54 | 70 | |
| S-54** | 54 | 208 | – | – | 150 | 200 | 224 lbs. (102 kg) |
| | | 240 | – | – | 130 | 175 | |
| | | 480 | – | – | 65 | 90 | |
| S-58** | 58.5 | 208 | | | 162.5 | 225 | 224 lbs. (102 kg) |
| | | 240 | – | – | 141 | 200 | |
| | | 480 | – | – | 71 | 90 | |

* Only 6, 7 & 9kW Models, 208 and 240 volts only, can be field converted to single phase (units are shipped 3-phase open delta). Larger branch circuit required than for balanced 3-phase of equal kW. (Balanced 3-phase available, consult factory.)
† 17.2kW Models available in 208v 3-phase only.
§ 18kW Models not available in 208v 3-phase.
* Not available in 208v single phase.
** Not available in 208v or 240v single phase.

## OPTIONS (NOT FOR RETROFIT)

- ❑ All Stainless Steel Body and Base

## ACCESSORIES

- ❑ Blended Phosphate Water Treatment System
- ❑ Shock Absorber – To Reduce Water Hammer
- ❑ Brass Pressure Reducing Valve with By-Pass
- ❑ Floor Mounting Hardware
- ❑ Adjustable Stainless Steel Legs 6" to 8" (15 to 20 cm)

## ARCHITECT SPECS

### Electric Booster Water Heaters

The Electric Booster Water Heater to supply the final 180°F (82°C) rinse for the dishwasher shall be a Hatco ....Model No. ....as manufactured for commercial use by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The booster shall have the capacity to heat ....gph (lph) from ....°F to 180°F (....°C to 82°C) and it shall be rated at ....kW, ....volts, ....phase. The tank shall be designed for a working pressure of 150 psi (1034 kPa) and include a Hatco Castone® lining.

The heater shall be complete with all internal plumbing, including ¾" NPT pipe and fittings for inlet and outlet. All controls shall be built-in, including contactors and prewired in accordance with UL #1453 and NEC 422-27. Proper surface mounting circuit breaker or fused disconnect switch shall be provided by electrical contractor.

Electric heating elements shall be metal sheathed, controlled by close tolerance immersion thermostats. The booster shall be protected with high temperature limit switch (ECO) and low water cut-off.

The heater shall consist of stainless steel front and silver gray hammertone body with standard 6" (15 cm) legs (or stainless steel body, base and stainless steel adjustable legs).

The heater shall include a temperature/pressure relief valve, high-temperature pressure reducing valve with bypass, indicating temperature/pressure gauges and shock absorber.

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T&S BRASS AND BRONZE WORKS, INC.
2 SADDLEBACK COVE / P.O. BOX 1088 / TRAVELERS REST, SC 29690
PHONE 800-476-4103 FAX 864- 834-3518

REG. #A2601
ISO #9002

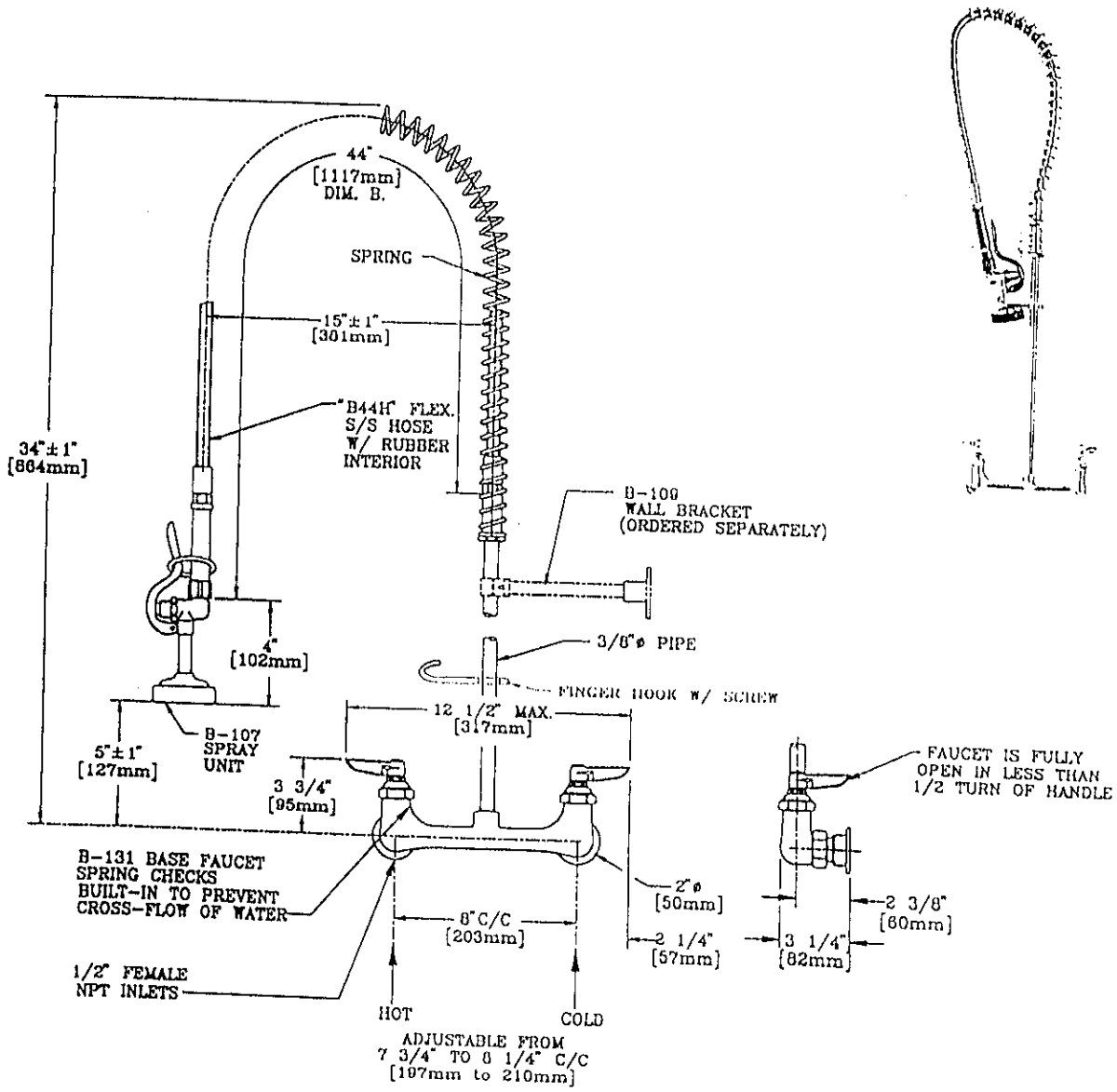
Model No. B-0133

Item No. #52

Job Name:

Architect/Engineer Approval:

Notes:




NOTE: ALSO AVAILABLE WITH 1/2" NPT MALE INLETS AND LOCKNUTS ON FAUCETS IN PLACE OF FEMALE INLETS.

STANDARD HOSE LENGTH=44"
OTHER HOSE LENGTHS AVAILABLE

Product Description:

PRE-RINSE UNIT

| Drawn: | Checked | Scale: |
|---|---|---|
| MCW | MW | 1.5" = 1' |
| Approved | | Date: |
| CA | | 10/2/95 |

ITEM# #54

# 3CS SANITIZING SINK HEATERS

Models 3CS-3, 3CS-4, 3CS-6, 3CS-9, 3CS-3B, 3CS-4B, 3CS-6B, 3CS-9B

The Hatco 3CS Sanitizing Sink Heater makes manual warewashing faster and more convenient. It maintains a continuous supply of sanitizing rinse water without taking up valuable sink space.

## FLEXIBILITY

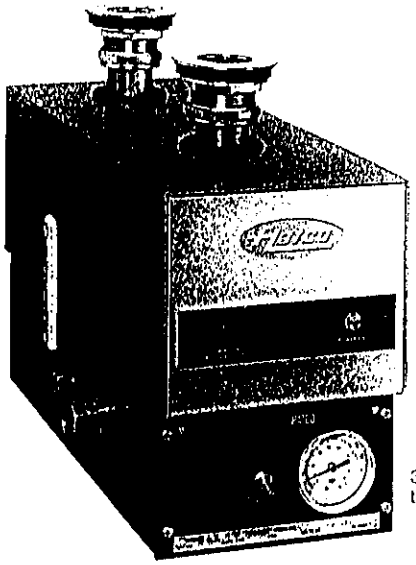
Designed to fit under the center of the sink, the 3CS is perfect for 3 or 4 compartment sinks, pot and pan sinks and bar sinks.

The 3CS features a unique dual reservoir system. One reservoir contains the heating element and should always be filled with water. The other reservoir traps and collects soil carried from other sink compartments. This reservoir is easily emptied after each use by a convenient drain.

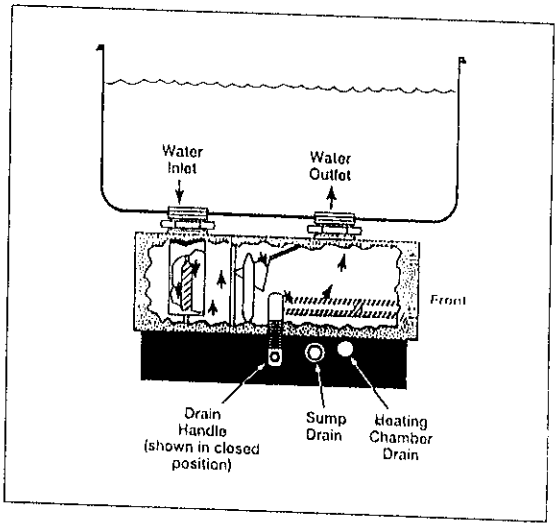
## QUALITY

The following features assure the finest performance for years to come.

- All models include stainless steel front, powder coated silver gray hammertone body and convenient side drain.
- Every Hatco 3CS is equipped with an ECO (Energy Cut-Off) wired into the electrical circuit. This built-in protection "breaks" the power to the elements if the temperature of the water goes above the normal thermostat setting.
- An on/off toggle switch activates the heater and a yellow light indicates when power is on. A red light is an overtemp indicator pointing out the need to refill the unit with water and reset the unit.
- Each 3CS model features a stainless steel tank with a 5 year warranty.
- Available with an optional temperature monitor or temperature light that indicates when water reaches the sanitizing temperature.
- The 3CS is shipped ready to install with all gaskets and fittings.



3CS-6 with optional temperature monitor




## WATER QUALITY REQUIREMENTS

Incoming water in excess of 3.0 grains of hardness per gallon (GPH) (.75 grains of hardness per liter) must be treated and softened before being supplied to booster heater(s). Water containing over 3.0 GPH (.75 GPL) will decrease the efficiency and reduce the operating life of the unit.

*Note: Product failure caused by liming or sediment buildup is not covered under warranty.*

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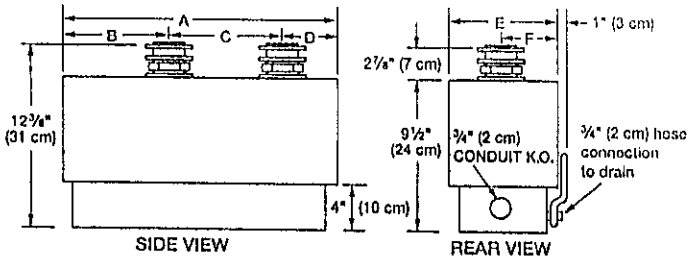
ITEM#

# 3CS SANITIZING SINK HEATERS

Models 3CS-3, 3CS-4, 3CS-6, 3CS-9, 3CS-3B, 3CS-4B, 3CS-6B, 3CS-9B




## DIMENSIONS

Single or 3-Phase: 6¾"L x 16⅞"W x 12⅝"H (17 x 43 x 32 cm).
Balanced 3-Phase: 8"L x 17⅛"W x 12⅝"H (20 x 44 x 32 cm).

| Model | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 or 3 phase | 16⅞" | 5½" | 8½" | 2⅞" | 6¾" | 3⅜" |
| | 43 cm | 14 cm | 22 cm | 7 cm | 17 cm | 9 cm |
| Bal. 3 phase | 17⅛" | 4⅝" | 8½" | 4" | 8" | 4" |
| | 44 cm | 12 cm | 22 cm | 10 cm | 20 cm | 10 cm |

## VOLTAGE

208 or 240 volts, 50/60 Hz standard. 480 volts and CSA wiring for Canada available. Export voltages available.

## SPECIFICATIONS

| Model | kW | Phase | Sink Area | Shipping Weight |
|---|---|---|---|---|
| 3CS-3 | 3 | 1 | 15" (38 cm) Sq. or less | 24 lbs. (11 kg) |
| 3CS-4 | 4.5 | 1 | 16"-18" (41-46 cm) Sq. | 24 lbs. (11 kg) |
| 3CS-6 | 6 | 1 or 3* | 19"-21" (48-53 cm) Sq. | 27 lbs. (12 kg) |
| 3CS-9 | 9 | 1 or 3* | 21"-25" (53-64 cm) Sq. | 27 lbs. (12 kg) |
| 3CS-3B† | 3 | 3 | 15" (38 cm) Sq. or less | 30 lbs. (14 kg) |
| 3CS-4B† | 4.5 | 3 | 16"-18" (41-46 cm) Sq. | 30 lbs. (14 kg) |
| 3CS-6B† | 6 | 3 | 19"-21" (48-53 cm) Sq. | 30 lbs. (14 kg) |
| 3CS-9B† | 9 | 3 | 21"-25" (53-64 cm) Sq. | 30 lbs. (14 kg) |

* Open delta on 3-phase. Larger circuit required than for balanced 3-phase of equal kW.
† Balanced 3-phase.

## ELECTRICAL RATINGS

| 208 Volt kW Rating | Phase | Amps | Wire Size AWG | Fuse or Circuit Breaker |
|---|---|---|---|---|
| 3.0 | 1 | 14.5 | 12 | 20 |
| 4.5 | 1 | 22 | 10 | 30 |
| 6.0 | 1 | 29 | 8 | 40 |
| 6.0 | 3* | 25 | 10 | 40 |
| 6.8 | 3 (Bal.) | 18.8 | 10 | 30 |
| 9.0 | 1 | 43 | 4 | 60 |
| 9.0 | 3* | 37 | 6 | 50 |
| 9.0 | 3 (Bal.) | 25 | 10 | 40 |

| 240 Volt kW Rating | Phase | Amps | Wire Size AWG | Fuse or Circuit Breaker |
|---|---|---|---|---|
| 3.0 | 1 | 12.5 | 12 | 20 |
| 4.5 | 1 | 19 | 10 | 30 |
| 6.0 | 1 | 25 | 10 | 40 |
| 6.0 | 3* | 22 | 10 | 30 |
| 6.0 | 3 (Bal.) | 14.4 | 12 | 20 |
| 9.0 | 1 | 38 | 6 | 50 |
| 9.0 | 3* | 33 | 8 | 40 |
| 9.0 | 3 (Bal.) | 22 | 10 | 30 |

| 480 Volt kW Rating | Phase | Amps | Wire Size AWG | Fuse or Circuit Breaker |
|---|---|---|---|---|
| 3.0 | 1 | 6.3 | 14 | 15 |
| 4.5 | 1 | 9.4 | 14 | 15 |
| 6.0 | 1 | 12.5 | 12 | 20 |
| 6.0 | 3* | 10.8 | 14 | 15 |
| 6.0 | 3 (Bal.) | 7.2 | 14 | 15 |
| 9.0 | 1 | 18.8 | 10 | 30 |
| 9.0 | 3* | 16.2 | 12 | 20 |
| 9.0 | 3 (Bal.) | 10.8 | 14 | 15 |

* Open Delta – standard construction (Amperage higher than Balanced 3 phase).

## SIZING INFORMATION

For a Sink Heater: 2000 watts per sq. ft. (2,2 watts per sq. cm) of vessel top.

3CS Sink Heaters are sized based on 140°F (60°C) supply water with a 30 minute preheat period to reach the sanitizing temperature. Sink Heaters are mounted in the center of the third compartment sink with standard plumbing fittings provided. Two 2" (5 cm) diameter holes are required for these fittings and a full size template is provided to locate holes in the sink. The 3CS Sink Heater is easily attached to the plumbing fittings with self contained unions.

## OPTIONS (NOT FOR RETROFIT)

- ❑ All Stainless Steel Body and Base
- ❑ Temperature Monitor (Not Available with Light)
- ❑ Temperature Light (Not Available with Monitor)
- ❑ Wiring to CSA Specifications

## ARCHITECT SPECS

### Sanitizing Sink Heaters

The electric heater to maintain the final sanitizing rinse in a third compartment sink shall be a Hatco Model 3CS as manufactured by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The Third Compartment Sink Heater shall be rated at ....kW, ....volts, ....phase. The heater shall be complete with all internal plumbing and wiring ready for external installation to the bottom of sink.

The heater tank shall be of stainless steel construction and dual reservoir design; one reservoir to contain a permanently submerged heating element, the other to trap and collect soil which can be emptied easily by a convenient drain.

The sink heater shall be equipped with an on-off reset switch and optional indicator lights (or gauge) to signal operating conditions.

The heater shall consist of stainless steel front and powder coated silver gray hammertone body (or stainless steel jacket and base).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RANDELL Air Systems Kitchen Ventilation

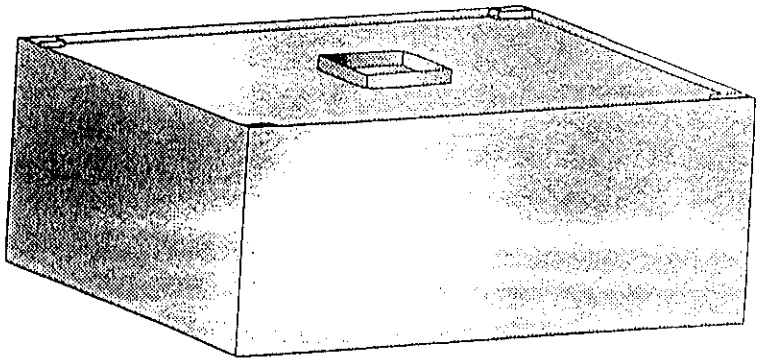
# VDW Series Condensate Canopy

#55

ITEM

DATE

NSF



## STANDARD FEATURES

- All #304 Stainless Steel Construction
- Hanging Brackets
- Perimeter Gutter With Drain
- Perforated Stainless Steel duct Protector

## OPTIONS

- 400 Series Stainless for Class II application

## OPERATION

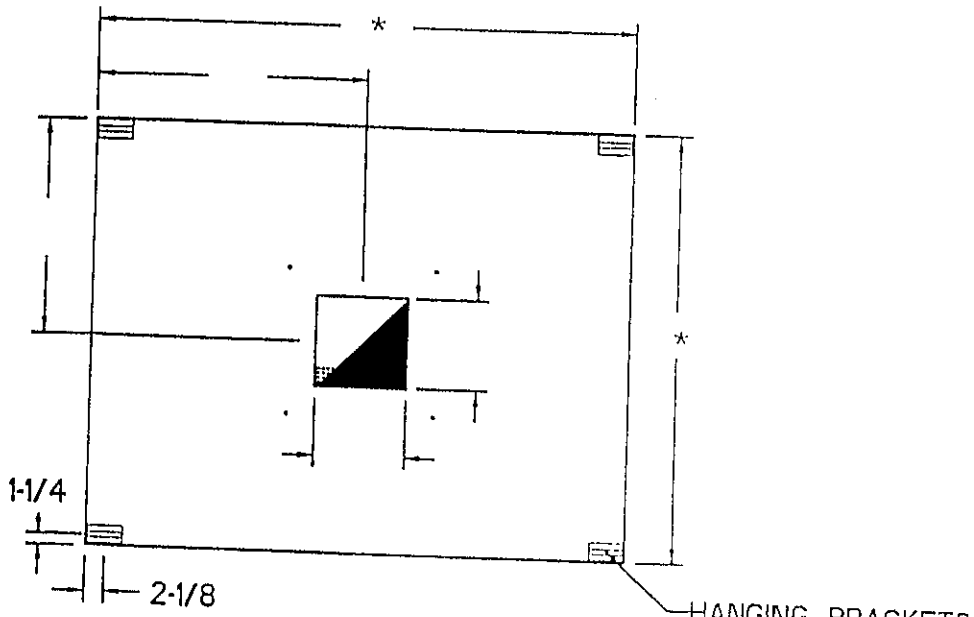
This is a direct draw condensate hood designed to ventilate steam producing equipment. Hood is constructed with perimeter gutter and a drain at one corner.

## USE

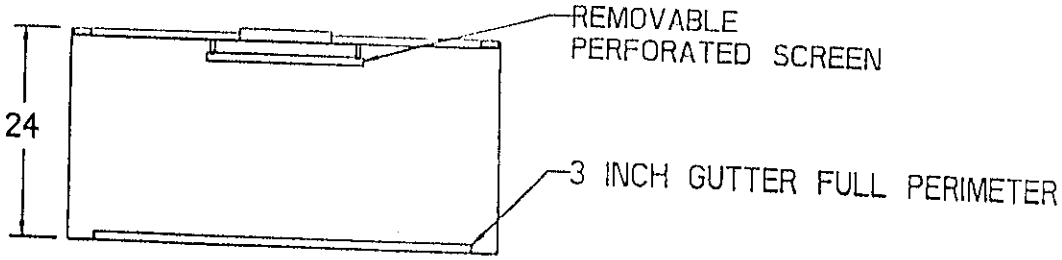
This model hood is recommended over automatic dishwashing machines and steam producing cooking equipment without an open flame.

## Model VDW

A single shell non compensating wall hung canopy designed to capture steam vapors. Hood shall be constructed of all stainless steel. Hood shall have a perimeter gutter with a drain in back corner of gutter and perforated stainless steel duct protector.




Plan View




Section

* DISHWASHER MODEL NUMBER OR SIZE REQUIRED BEFORE MANUFACTURE

## EXHAUST RATE REQUIREMENTS

| CFM/FT BASED ON HOOD OVERHANG | | | |
|---|---|---|---|
| | 6" overhang | 12" overhang | 18" overhang |
| CFM Exhaust / Ft. | 200 | 150 | 100 |

Due to a continuous program of product improvement, Randell reserves the right to make changes in design and specifications without prior notice

# Galley® Line

## Sanitary, Heavy Duty
## Flat Top Utility Module

Item No. #58

**Model No. 9310**
**Model No. 9330**
**Model No. 9340**
**Model No. 9350**

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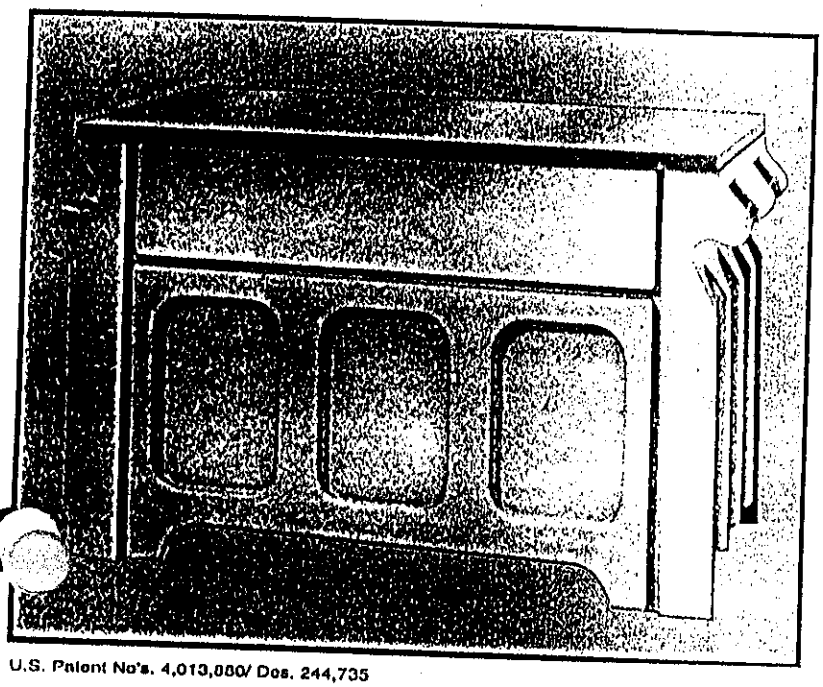


U.S. Patent No's. 4,013,080/ Des. 244,735

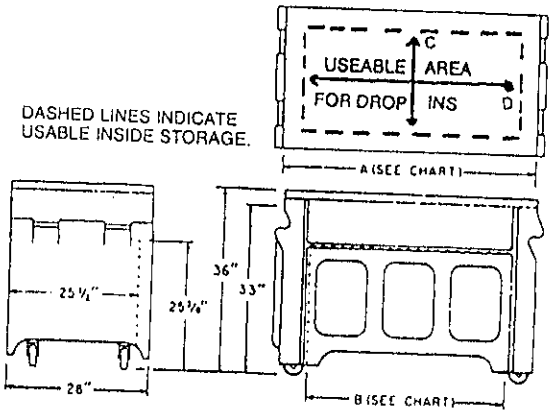
**Utility Module** – Attractively merchandises and sells pastries and breads. Helps to increase check averages. Available in four widths.

- Aesthetic design, three neutral colors, dove white, pewter tan or black pearl blend in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.
- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.

**Utility Module**

| Cat. No. | Module Size W | D | H | Shpg. Wt. Lbs. | Quantity of Decorator Panels Included |
|---|---|---|---|---|---|
| 9310 | 28" | 28" | 36" | 105 | 1 |
| 9330 | 50" | 28" | 36" | 170 | 3 |
| 9340 | 64 ½" | 28" | 36" | 195 | 4 |
| 9350 | 79" | 28" | 36" | 225 | 5 |

SPECIFICATION DRAWING OF BASIC UNIT




| Cat. No. | Dim. 'A' | Dim. 'B' | Dim. 'C' | Dim. 'D' |
|---|---|---|---|---|
| 9310 | 28" | 17" | 22 ¾" | 22" |
| 9330 | 50" | 39" | 22 ¾" | 44" |
| 9340 | 64 ½" | 53 ½" | 22 ¾" | 58 ½" |
| 9350 | 79" | 68" | 22 ¾" | 73" |

To be **Galley® Line** Flat Top Utility Module_____ with accessories as specified.

**GENERAL:** Unit to be self-contained, mobile Utility module for room temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-locking and aligning end panels allow modules to be interconnected. To have recessed push handles at each end. Removable side panel on customer's side to be recessed to accept decorator panels. Server's side to be open to accept accessories. To be listed by National Sanitation Foundation and Underwriters Laboratories, Inc.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal undercarriage. 14 ga. 300 series stainless steel top to have not less than #4 finish. Plate mounted 4" diameter swivel casters with toe brakes to be provided.

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications. Add 3 ½" to depth for folded trayslide and 3 ¼" for folded cutting board.

1-561-748-5200 • Fax 1-561-748-5250 • Galley®

# Galley® Line

## Sanitary, Heavy Duty
## Self-Leveling Dish, Glass & Tray Dispensers

Item No. #58

| | | |
|---|---|---|
| Model No. 8850 | Model No. 8859 | Model No. 8868 |
| Model No. 8851 | Model No. 8860 | Model No. 8869 |
| Model No. 8852 | Model No. 8861 | Model No. 8870 |
| Model No. 8853 | Model No. 8862 | Model No. 8871 |
| Model No. 8854 | Model No. 8863 | Model No. 8872 |
| Model No. 8855 | Model No. 8864 | Model No. 8873 |
| Model No. 8856 | Model No. 8865 | Model No. 8874 |
| Model No. 8857 | Model No. 8866 | Model No. 8875 |
| Model No. 8858 | Model No. 8867 | Model No. 8876 |

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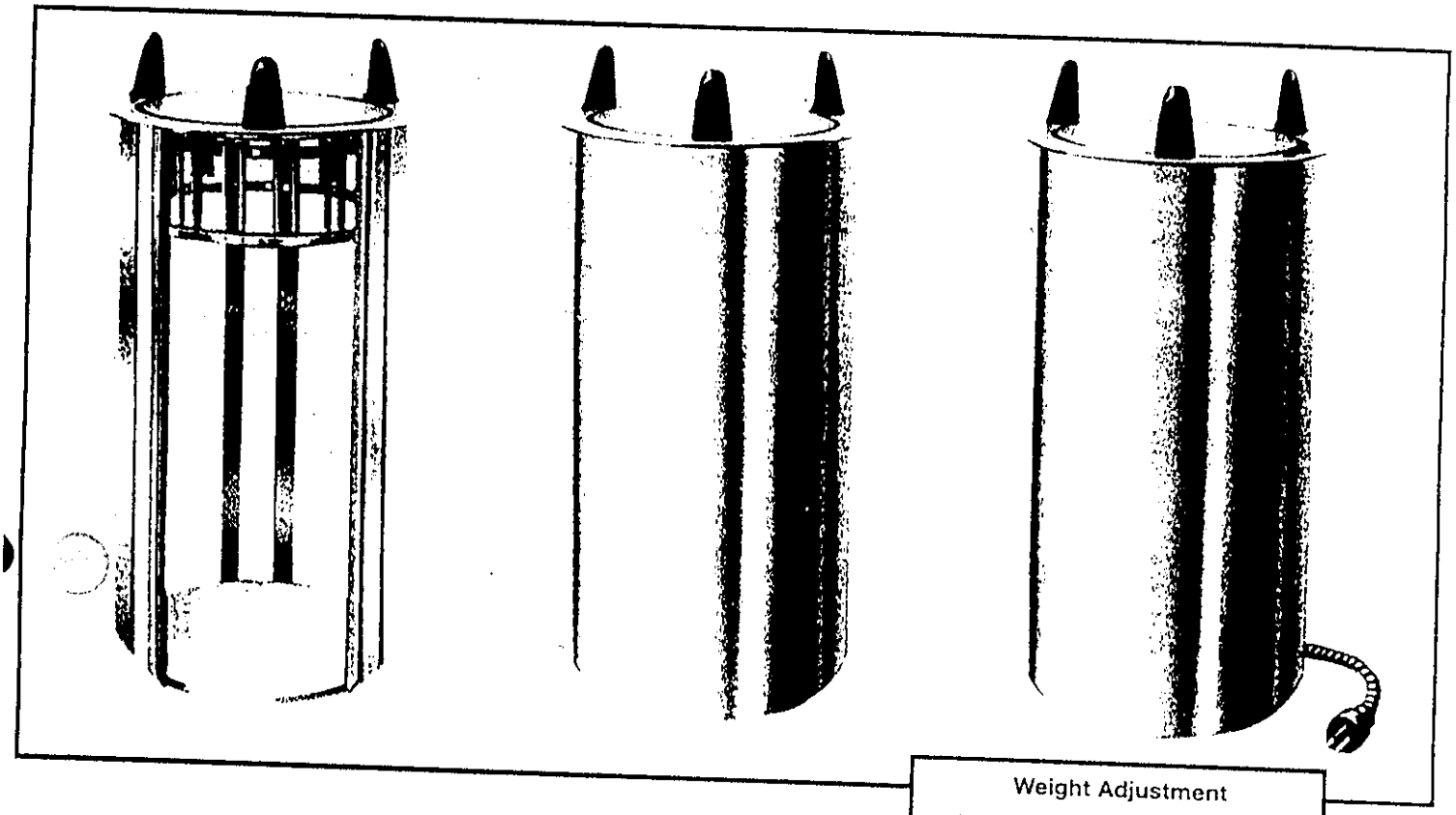
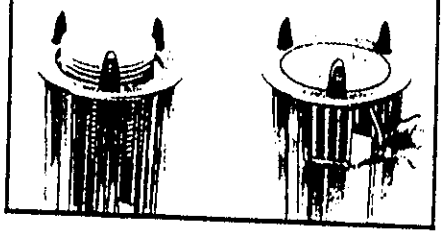
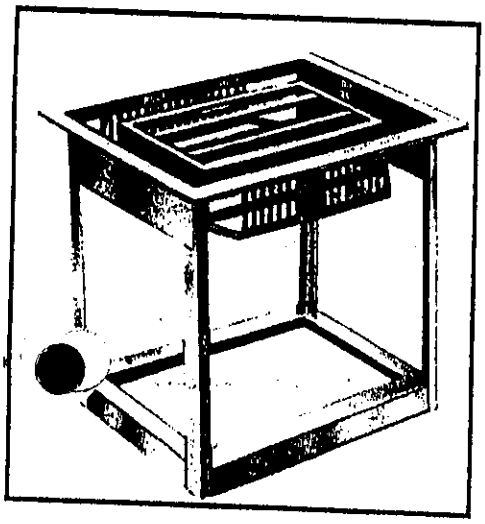


Weight Adjustment



## Self-Leveling Tray & Glass Rack Dispensers

NSF UL



Keeps trays, glasses and cups where they should be, at convenient counter height. All dispensers are completely field adjustable for proper dispensing without tools.

Easy field adjustment for plate weight, simply detach or attach springs.

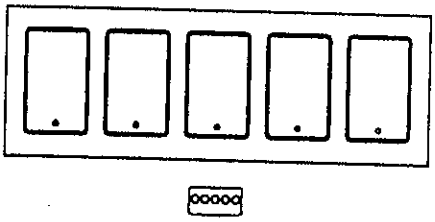
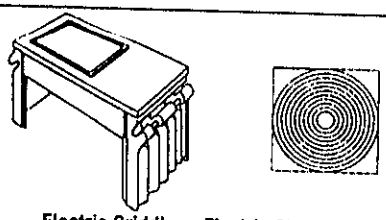
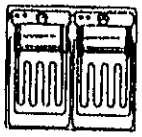
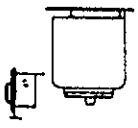
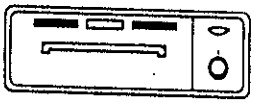
Heated model has an adjustable thermostat to control temperatures between 100°F - 200°F. Safety cover protects the on/off switch.

Dish capacity up to 72 dishes

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

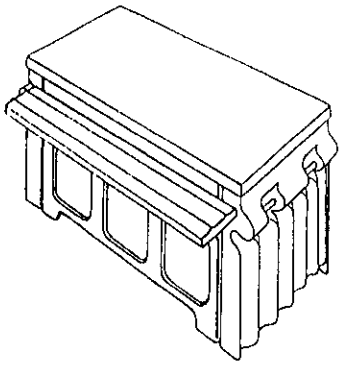
| Drop-In Accessories | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Extra Deep Hot Wells with Drains, Manifold and Individual Thermostats for Each Well - Wet or Dry | **Hot Wells - 6" Deep:** With thermostat controls and individual drains connected to manifold with drain valve and raised rim top. | Prices include complete installation in Galley module. | | | | | | | |
| | **Electric 120/60/1 1200W, 10 Amps Per Well - 5 Wells Require Direct Line. (No Cord & Plug).** | | | | | | | | |
| | 1 Well 6" Deep | 8920 | 35 | 8920 | 35 | 8920 | 35 | 8920 | 35 |
| | 2 Wells 6" Deep | Not Available | | 8921 | 70 | 8921 | 70 | 8921 | 70 |
| | 3 Wells 6" Deep | Not Available | | 8922 | 105 | 8922 | 105 | 8922 | 105 |
| | 4 Wells 6" Deep | Not Available | | Not Available | | 8923 | 140 | 8923 | 140 |
| | 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8924 | 175 |
| | **Electric 208/240/60/1 900W/1200W/4.3 Amps/5 Amps** | | | | | | | | |
| | 1 Well 6" Deep | 8925 | 35 | 8925 | 35 | 8925 | 35 | 8925 | 35 |
| | 2 Wells 6" Deep | Not Available | | 8926 | 70 | 8926 | 70 | 8926 | 70 |
| | 3 Wells 6" Deep | Not Available | | 8927 | 105 | 8927 | 105 | 8927 | 105 |
| | 4 Wells 6" Deep | Not Available | | Not Available | | 8928 | 140 | 8928 | 140 |
| | 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8929 | 175 |
| Hot Wells-4" Deep | **Electric Hot Wells - 4" Deep:** With Infinite controls- **No Drains** | Prices include complete installation in Galley module. | | | | | | | |
| | **1 Well 4" Deep** | | | | | | | | |
| | 120V, 1Ph., 500W | 8829 | 35 | 8829 | 35 | 8829 | 35 | 8829 | 35 |
| | 208V, 1Ph., 500W | 8930 | 35 | 8930 | 35 | 8930 | 35 | 8930 | 35 |
| | 240V, 1Ph., 500W | 8931 | 35 | 8931 | 35 | 8931 | 35 | 8931 | 35 |
| | **Drains & Manifold for 9030 to 9054** | Not Available | | 8846 | 10 | 8848 | 15 | 8849 | 20 |
| | **Gas Hot Wells - 8"Deep & S/S Covered Rear panel** | Not Available | | 8984 | 120 | 8985 | 210 | 8986 | 240 |
|  Electric Griddle or Electric Char Broiler Induction Cookers | **Electric Griddle** | | | | | | | | |
| | 25" Wide–208V/240V | Not Available | | 8728 | 132 | 8728 | 132 | 8728 | 132 |
| | 36.5" Wide–208V | Not Available | | 8729 | 187 | 8729 | 187 | 8729 | 187 |
| | 36.5" Wide–240V | Not Available | | 8730 | 187 | 8730 | 187 | 8730 | 187 |
| | **Electric Charbroiler** | | | | | | | | |
| | 25" Wide 208V | Not Available | | 8847 | 200 | 8847 | 200 | 8847 | 200 |
| | Installed in Side Skirt and Top: Specify Location– Right, Left or Center of Server. Bracing is Included. | | | | | | | | |
| | **Induction Cookers 208/60/1 1800 Watt** | 8968 | 25 | 8968 | 25 | 8968 | 25 | 8968 | 25 |
|  Fry Kettle | **Single Well Fryer** 14 3/4" W. x 23 1/2" D. | 8832 | 36 | 8832 | 36 | 8832 | 36 | 8832 | 36 |
| | **Double Well Fryer** 24 13/16" W. x 23 7/8" D. | 8833 | 74 | 8833 | 74 | 8833 | 74 | 8833 | 74 |
|  Soup, Chili or Cereal Hot Well | Prices include complete installation in Galley module. | | | | | | | | |
| | **Round Warmers** | | | | | | | | |
| | 7 Qt. | 8841 | 26 | 8841 | 26 | 8841 | 26 | 8841 | 26 |
| | 11 Qt. | 8842 | 27 | 8842 | 27 | 8842 | 27 | 8842 | 27 |
| | Infinite Control Supplied | | | | | | | | |
| | Cook and Hold, 11 qt. | 8842C | 30 | 8842C | 30 | 8842C | 30 | 8842C | 30 |
|  Heated Drawer For 12"x20"x6" Pans | **Drawer Warmer** 450 Watts per Drawer | | | | | | | | |
| | **Single:** 29 1/4"W x 21 1/2"D x 14 7/8"H | Not Available | | 8839 | 89 | 8839 | 89 | 8839 | 89 |
| | **Double:** 29 1/4"W x 21 1/2"D x 25"H | Not Available | | 8840 | 175 | 8840 | 175 | 8840 | 175 |

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

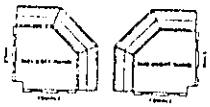
NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

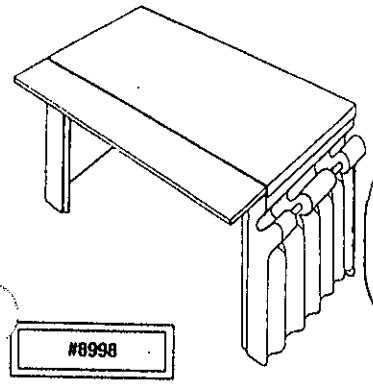


Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 7/8 | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| New! 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

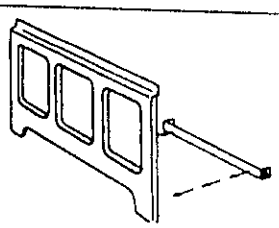


Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029



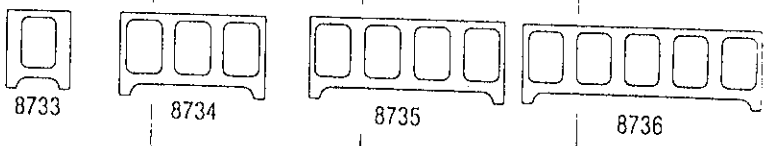

Cutting Boards, Stainless Plate Rests, Extended Tops

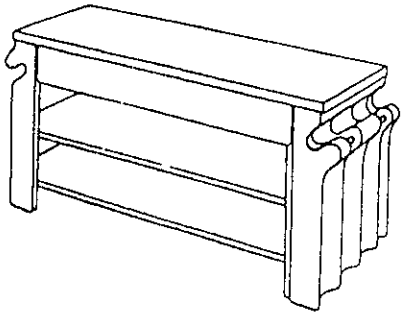
| Description | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7/8 | |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | | | | | | | | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843 | | | | | | | | |
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable** (NSF), Wood 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |



Closure and Access Panel (8734 Shown)

| Description | 28" Width | | 50" Width | | 64.5" Width | | 79" Width | |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)

| Description | 28" Width | | 50" Width | | 64.5" Width | | 79" Width | |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. **Note: #9230, #9231, & #9630** cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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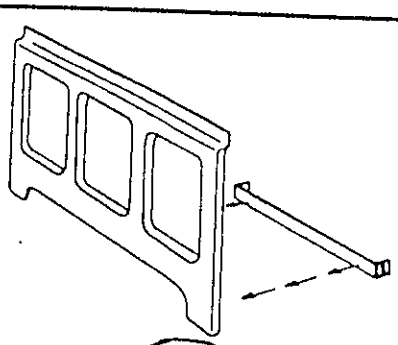
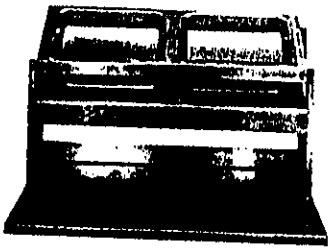
☐ **No. 8723 Divider Tray.** 17½" x 19 1/16" aluminum tray to hold milk cartons, shakes, dixie cups and other products in a refrigerated unit.



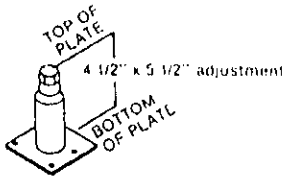
☑ **No's. 8733, 8734, 8735, 8736 Close-Off Back Panel.** Material to be of flame retardant ABS formed plastic. Removable close-off side panel to be recessed too accept decorator panels.

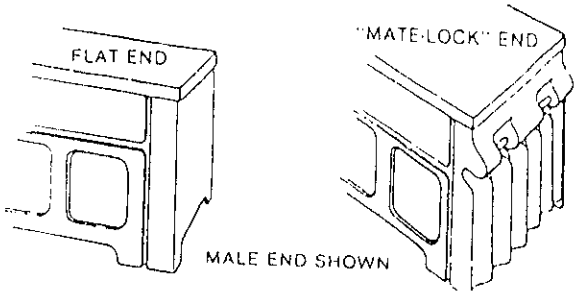
☐ **No's. 8960, 8961, 8962, 8963 Wall Hutch.** Material to be #4 polish stainless steel with stainless steel doors, recessed latches, locks & keys, stainless steel wall guard, and stainless steel shelves.



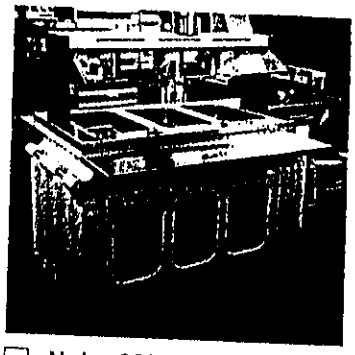
☐ **No's. 8624, 8625, 8626, 8627 Recessed & Angled Display Shelves.** Material to be #4 polish stainless steel with slanted shelves with cut outs for food service pans. May be mounted back to back for double service.

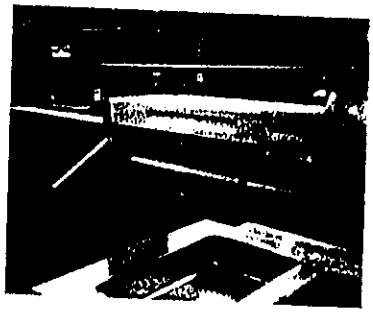
☐ **No. 8783 Bullet Feet (Set of 4).** Plated metal legs with 1" adjustment. Used in lieu of casters.



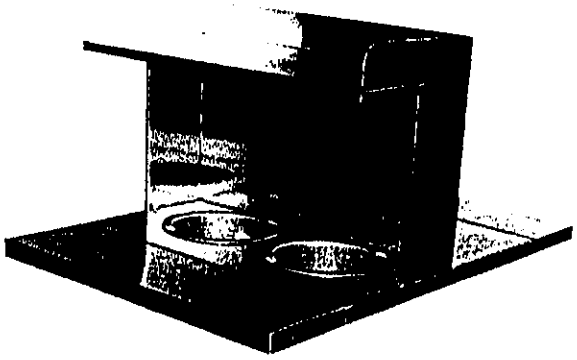

☐ **No's. 8731, 8732 Flat End Panel (Replaces Male/Female "Matelock").** Neutral colors, dove white, pewter tan or black pearl. Made of flame retardant ABS formed plastic material. Panel allows for squaring end of module to wall where necessary. 8731 fits female. 8732 fits male.





☐ **No's. 8639, 8640, 8641 Safety Glass** framed in stainless steel in lieu of Plastic for heat lamp canopy and **No. 8978 Lift Up Option.**

☐ **No's. 8895, 8897, 8898, 8899 Safety Glass** framed in stainless steel in lieu of Plastic for lighted buffet canopies.



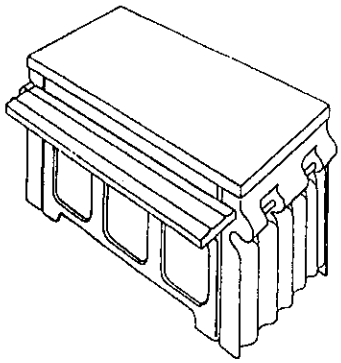
☐ **No's. 8719, 8943 Soup Cup Shelf.** Stainless steel with side walls & rear wall cup retainers. Shown with optional plate rests and soup wells.

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

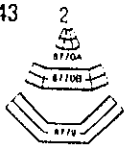
## Accessories

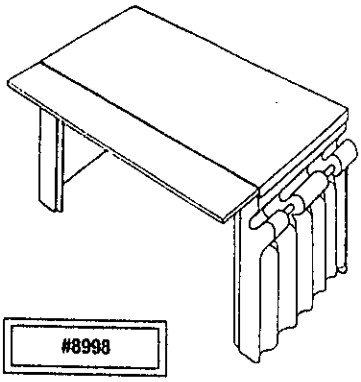


Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 7 | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| New! 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029

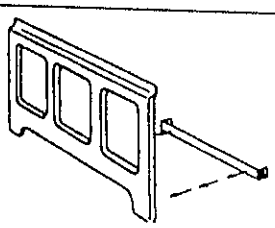




#8998

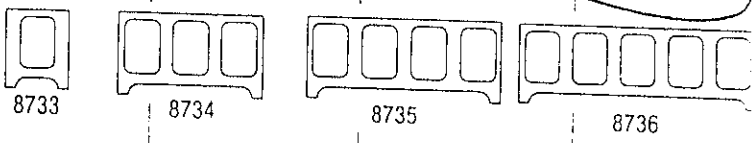
Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7/ | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843 | | | | | | | | |
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

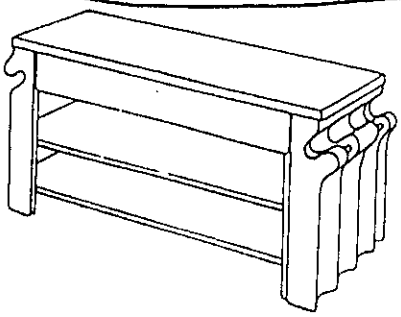


Closure and Access Panel (8734 Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves** | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| **Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. Note: #9230, #9231, & #9630 cannot accommodate an undershelf. Undershelves not available for corner modules. | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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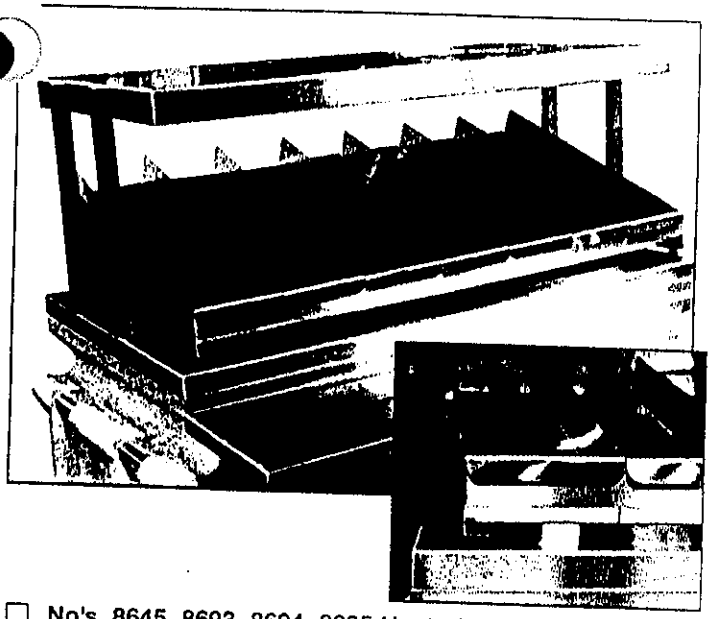
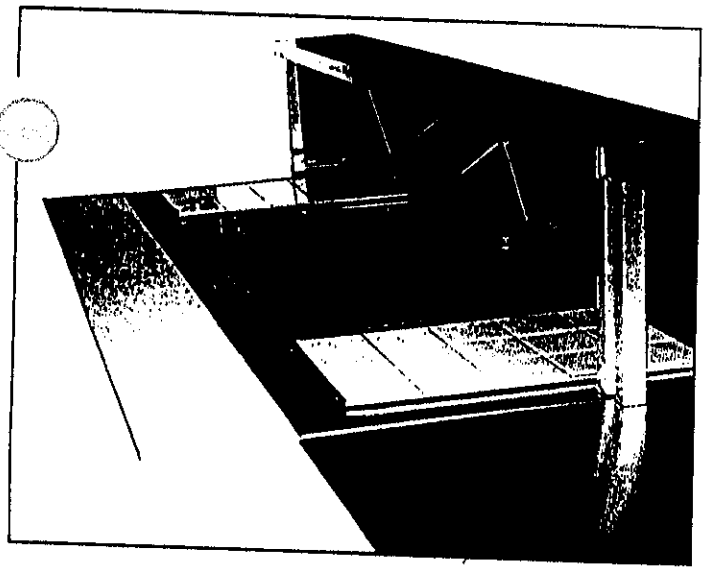


☐ **No's. 8645, 8693, 8694, 8695 Heated Merchandiser.** For hot sandwiches & french fries. Display shelf with infrared heat under top shelf & mounted to module top. Gravity feed bag chutes are stainless steel and lift up for cleaning.

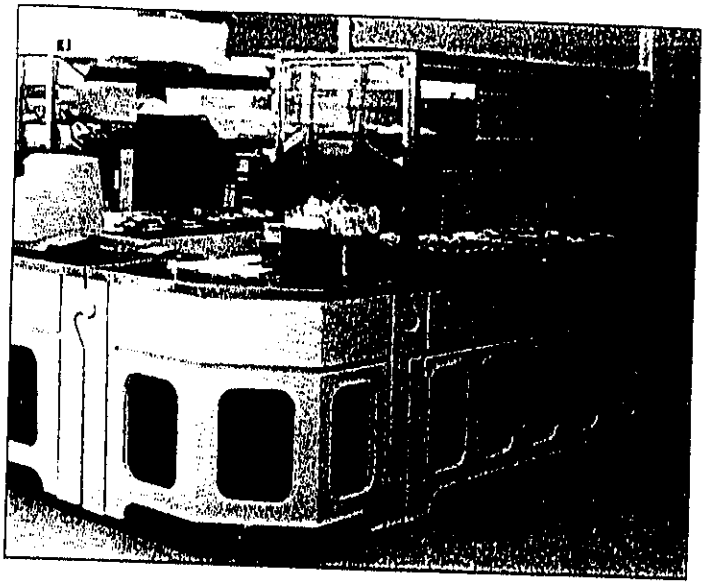


☐ **No's. 8932, 8933, 8934, 8935 Stainless Steel Top Food Protector.** Unlighted safety glass front.

☐ **No's. 8936, 8937, 8938, 8939 Stainless Steel Top Food Protector.** Lighted safety glass front.

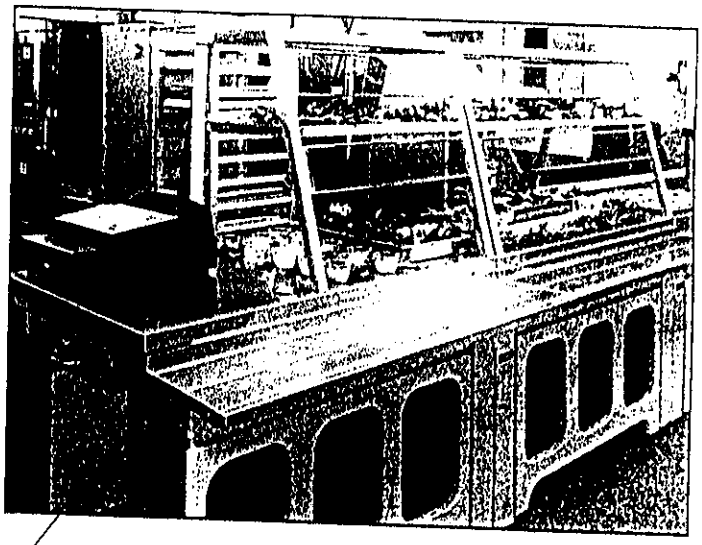
☐ **No's. 8712, 8763, 8764, 8765 Folding Drop Down Cutting Board or Work Surface.** 8" x 1" white Poly removable for cleaning.

☐ **No. 8968 Induction Cookers.** (3 shown) Dropped into module and wired to junction box.



☐ No's. 8913, 8914, 8915, 8916, 8917 Vertical Glass Protectors. 28" high safety glass in a stainless steel frame.

☐ No's. 8721, 8722, 8713, 8714, 8900, 8901, 8902, 8903 Angled Stainless Steel Display with Slanted Shelves. With or without optional heat lamps 8992, 8992A, 8992B, 8992C.

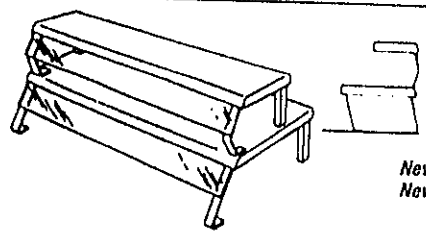
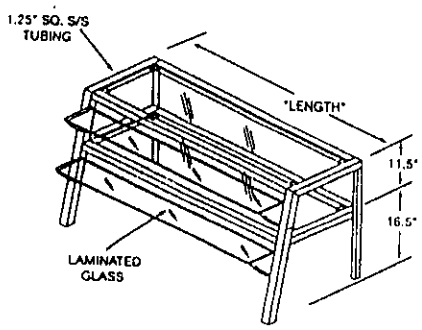
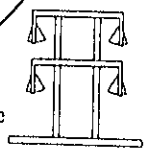
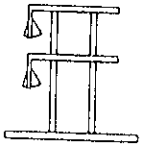
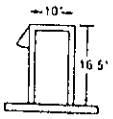
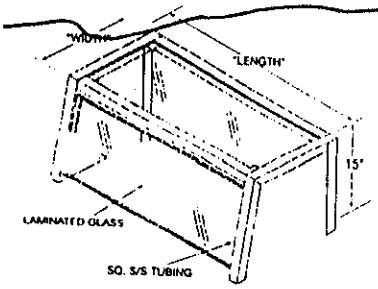
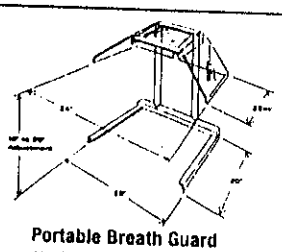
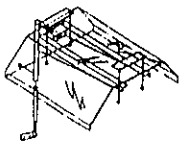
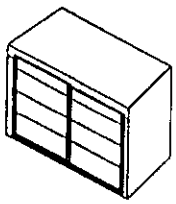
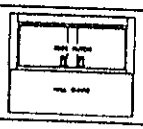


☑ No's. 8616, 8617, 8618, 8619, 8632, 8633, 8634, 8684, 8970, 8971, 8972, 8973, 8974, 8975, 8976, 8977 Double Deck Displays with Stainless Steel Uprights. Saftey glass and adjustable stainless steel food protectors all framed with stainless steel.

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

| Food Protectors | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  New! New! Double Deck Display, Solid Shelves | **Pewter Tan, Dove White or Black Pearl Shelves:** | | | | | | | | |
| | Unlighted | 8797 | 92 | 8785 | 97 | 8786 | 103 | 8787 | 108 |
| | Lighted | 8819 | 107 | 8788 | 112 | 8789 | 118 | 8790 | 124 |
| | **Stainless Steel Shelves:** | | | | | | | | |
| | Unlighted | 8646 | 92 | 8647 | 97 | 8648 | 103 | 8649 | 108 |
| | Lighted | 8749 | 107 | 8795 | 112 | 8798 | 118 | 8799 | 124 |
| | Safety Glass | 8628 | 50 | 8629 | 75 | 8630 | 106 | 8631 | 125 |
| | **Replacement Items:** Breath Guard | 7002321 - 2 Required | | 7001172 - 2 Required | | 7001173 - 4 Required | | 7001173 - 4 Required | |
|   Double Deck Glass Display (Single Service Shown) | **Double Deck Glass Shelves and Adjustable Glass Breath Protector** | | | | | | | | |
| | Single Service, Unlighted | 8616 | 192 | 8617 | 197 | 8618 | 203 | 8619 | 208 |
| | Double Service, Unlighted | 8632 | 210 | 8633 | 212 | 8634 | 218 | 8684 | 224 |
| | Single Service, Lighted | 8970 | 202 | 8971 | 217 | 8972 | 223 | 8973 | 228 |
| | Double Service, Lighted | 8974 | 220 | 8975 | 232 | 8976 | 238 | 8977 | 244 |
| | Single Deck, Glass Shelf and Adjustable Glass Breath Protector Unlighted | 8517 | 100 | 8518 | 115 | 8519 | 130 | 8520 | 145 |
| | Double Service  | | | Single Service  | | | | Single Deck   | |
|   Single Deck Glass Protector | **Single Deck Glass Top Food Protector** Unlighted | 8904 | 140 | 8905 | 150 | 8906 | 162 | 8907 | 174 |
| | **Single Deck Stainless Steel Top Food Protector** | | | | | | | | |
| | Unlighted | 8932 | 120 | 8933 | 130 | 8934 | 142 | 8935 | 154 |
| | Lighted | 8936 | 135 | 8937 | 145 | 8938 | 157 | 8939 | 169 |
| | **Verticle Glass Protectors** Up to 28" High in Stainless Frame | 8913 | 100 | 8914 | 110 | 8915 | 120 | 8916 | 130 |
| | **For Corners** | 8917 | 125 | | | | | | |
|  New! Portable Breath Guard Vertical adjustment to 20" | **Portable Breath Guard Unlighted;** For use on 9011,9012, 9310, etc. | 8724 | 70 | 8724 | 70 | 8724 | 70 | 8724 | 70 |
| | **Corner Breath Guard** Fixed, Unlighted; | 8720 | 70 |  | | | | | |
| | **Replacement Items:** Breath Guard Knurled Knobs | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | |
|  ...gerated Display Merchandiser Pass Thru / See Thru | **Pass Thru / See Thru Refrigerated Display Merchandisers** Sliding Glass Doors on both sides. Prices include complete installation in Galley Module. Compressor Mounted in Module Base. | Not Available Refrigerated Base with Compressor | | 8908 550 Not Available 1/2 HP 12 Amps 115 / 60 / 1 | | 8909 675 8982 250 3/4 HP 16 Amps 115 / 60 / 1 | | 8910 825 8983 275 3/4 HP 16 Amps 115 / 60 / 1 | |
|  | **Over Counter Wall Hutch with** Doors, Shelves & Wall Guard All S/S | 8960 | 250 | 8961 | 350 | 8962 | 400 | 8963 | 450 |



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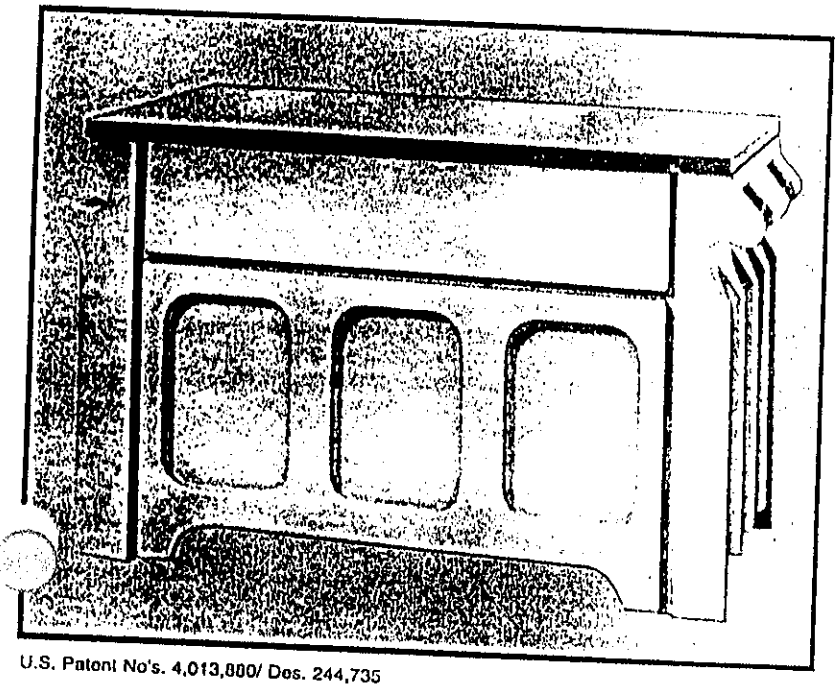
# Galley® Line

## Sanitary, Heavy Duty
## Flat Top Utility Module

Item No. #59

**Model No. 9310**
**Model No. 9330**
**Model No. 9340**
**Model No. 9350**

A1A11420



U.S. Patent No's. 4,013,880/ Des. 244,735

**Utility Module** – Attractively merchandises and sells pastries and breads. Helps to increase check averages. Available in four widths.

- Aesthetic design, three neutral colors, dove white, pewter tan or black pearl blend in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.
- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.

**Utility Module**

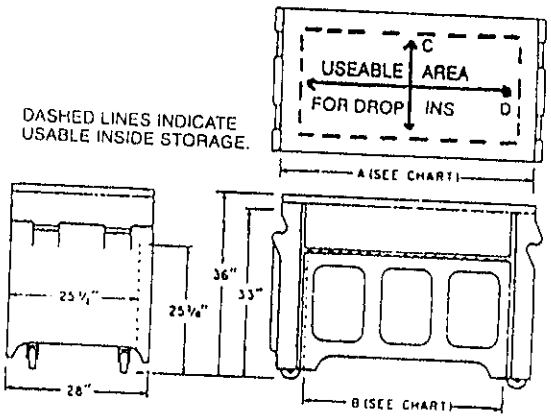
| Cat. No. | Module Size W | D | H | Shpg. Wt. Lbs. | Quantity of Decorator Panels Included |
|---|---|---|---|---|---|
| 9310 | 28" | 28" | 36" | 105 | 1 |
| 9330 | 50" | 28" | 36" | 170 | 3 |
| 9340 | 64 ½" | 28" | 36" | 195 | 4 |
| 9350 | 79" | 28" | 36" | 225 | 5 |

To be **Galley® Line** Flat Top Utility Module_____ with accessories as specified.

**GENERAL:** Unit to be self-contained, mobile Utility module for room temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-locking and aligning end panels allow modules to be interconnected. To have recessed push handles at each end. Removable side panel on customer's side to be recessed to accept decorator panels. Server's side to be open to accept accessories. To be listed by National Sanitation Foundation and Underwriters Laboratories, Inc.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal undercarriage. 14 ga. 300 series stainless steel top to have not less than #4 finish. Plate mounted 4" diameter swivel casters with toe brakes to be provided.

**SPECIFICATION DRAWING OF BASIC UNIT**




| Cat. No. | Dim. 'A' | Dim. 'B' | Dim. 'C' | Dim. 'D' |
|---|---|---|---|---|
| 9310 | 28" | 17" | 22 ¾" | 22" |
| 9330 | 50" | 39" | 22 ¾" | 44" |
| 9340 | 64 ½" | 53 ½" | 22 ¾" | 58 ½" |
| 9350 | 79" | 68" | 22 ¾" | 73" |

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications. Add 3 ½" to depth for folded trayslide and 3 ¼" for folded cutting board.

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# Galley® Line Flat Top Utility Module
# Model No's. 9310, 9330, 9340, 9350

**ACCESSORIES:**

A. Decorator panels, specify catalog number and quantity. (See chart on front side).
- ☐ Catalog No. 8700 American Walnut, Quantity_____ Included.
- ☐ Catalog No. 8701 Teakwood, Quantity_____.
- ☐ Catalog No. 8702 Plain Custom Panel, Quantity_____.

B. Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
- ☐ Catalog No. 8771, (*Short 28") 20⅞" width, used on 9310.
- ☐ Catalog No. 8772, 28" width, used on 9310.
- ☐ Catalog No. 8773, (*Short 50") 42⅞" width, used on 9330.
- ☐ Catalog No. 8774, 50" width, used on 9330.
- ☐ Catalog No. 8775, (*Short 64½") 57⅜" width, used on 9340.
- ☐ Catalog No. 8776, 64½" width, used on 9340.
- ☐ Catalog No. 8777, (*Short 79") 71⅞" width, used on 9350.
- ☐ Catalog No. 8778, 79" width, used on 9350.

***Note:** A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

C. Food Protector with plastic shelf, breathguard and stainless steel upright supports. 14" high. Field mounted. Not available on model 9310.
- ☐ Catalog No. 8780, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8791, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8781, 64½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8792, 64½" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8782, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8793, 79" width, used on 9350. Lighted. UL listed.

D. Double Deck Display Stand with two plastic shelves, breathguard and stainless steel upright supports. 18" high.
- ☐ Catalog No. 8785, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8788, 50" width, used on 9330. Lighted.
- ☐ Catalog No. 8786, 64½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8789, 64½" width, used on 9340. Lighted.
- ☐ Catalog No. 8787, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8790, 79" width, used on 9350. Lighted.

E. Folding Cutting Board. All plastic. Mounted flush on server's side. Not available on Model 9310.
- ☐ Catalog No. 8763, 50" width, used on 9330.
- ☐ Catalog No. 8764, 64½" width, used on 9340.
- ☐ Catalog No. 8765, 79" width, used on 9350.

F. Extension shelf. Stainless steel. Mounted flush with top of module. Self-mounting. 16" wide x 28" deep.
- ☐ Catalog No. 8754. (Not for use with item L or M).

G. Undercounter Shelving System. Maximum: two per unit. All stainless steel. Removable. 18" depth with 1" front edge.
- ☐ Catalog No. 8756, 19½" width, used on 9310.
- ☐ Catalog No. 8757, 41½" width, used on 9330.
- ☐ Catalog No. 8758, 56 1/16" width, used on 9340.
- ☐ Catalog No. 8759, 70½" width, used on 9350.

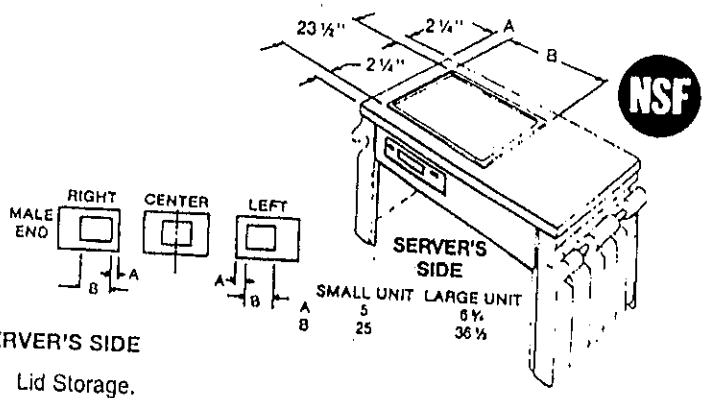
H. Utility Drawer. Stainless steel. Has lock and removable liner. Outside dimensions: 25¼"W x 23"D x 7¼"H. Mounted to right on server's side. Will not fit Model 9310.
- ☐ Catalog No. 8760.

I. "Mateflat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5⅜"W x 28"D x 36"H.
- ☐ Catalog No. 8761 Male Panel (Fits female end).
- ☐ Catalog No. 8762 Female Panel (Fits male end).

J. Heated Shelf.
- ☐ Catalog No. 8726, use with 50" unit.

K. Griddle.
- ☐ Catalog No. 8728, 25" 208-240V. 1 & 3 phase. UL listed.
- ☐ Catalog No. 8729, 36½" 208V. 1 & 3 phase. UL listed.
- ☐ Catalog No. 8730, 36½" 240V. 1 & 3 phase. UL listed.

Griddle: Controlled by dual-variable thermostats with signal lights. Top is one-half inch thick polished steel. Grease trough empties into front removable grease drawer. Griddle furnished with stainless steel cover.




SERVER'S SIDE

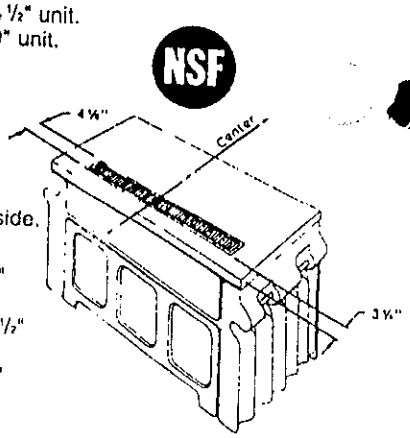
L. Lid Storage.
- ☐ Catalog No. 8727.

M. Flat End Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring to wall.)
- ☐ Catalog No. 8731, Replaces female "matelock".
- ☐ Catalog No. 8732, Replaces male "matelock".

N. Cutting Board for Griddle.
- ☐ Catalog No. 8763, use with 50" unit.
- ☐ Catalog No. 8764, use with 64½" unit.
- ☐ Catalog No. 8765, use with 79" unit.

O. Drain.
- ☐ Catalog No. 8715, 18" long.
- ☐ Catalog No. 8716, 24" long.
- ☐ Catalog No. 8717, 30" long.
- ☐ Catalog No. 8718, 36" long.

Drain trough with drain hose and valve to be located on customer's side.




P. Merchandising Shelf.
- ☐ Catalog No. 8722, use with 50" width unit.
- ☐ Catalog No. 8713, use with 64½" width unit.
- ☐ Catalog No. 8714, use with 79" width unit.

Q. Portable Breathguard.
- ☐ Catalog No. 8724.

R. Buffet Style Canopy.
- ☐ Catalog No. 8740, use with 50" width unit. UL listed.
- ☐ Catalog No. 8741, use with 64½" width unit. UL listed.
- ☐ Catalog No. 8742, use with 79" width unit. UL listed.

Specifications subject to change without notice.

S. Low End Shelf.
- ☐ Catalog No. 8725. (Not for use with item I or M).

T. Buffet Style Canopy with Heat Lamps.
- ☐ Catalog No. 8743, use with 50" unit. UL listed.
- ☐ Catalog No. 8744, use with 64½" unit. UL listed.
- ☐ Catalog No. 8745, use with 79" unit. UL listed .

U. Close-Off for Server's Side.
- ☐ Catalog No. 8733, use with 28" width unit.
- ☐ Catalog No. 8734, use with 50" width unit.
- ☐ Catalog No. 8735, use with 64½" width unit.
- ☐ Catalog No. 8736, use with 79" width unit.

V. Electrical Outlets (Not UL listed).
- ☐ Catalog No. 8696, Tombstone, Top Mounted, Duplex, 125V, 15 AMP
- ☐ Catalog No. 8697, Operator Side, Under Top Skirt, Duplex, 120V, 16 AMP.
- ☐ Catalog No. 8698, Operator Side, Under Top Skirt, Duplex, 120V, 15 AMP.
- ☐ Catalog No. 8699, Operator Side, Under Top Skirt, Single, 120V, 15 AMP

Note: #8696 and #8697 are part of the module wiring. #8698 and #8699 have separate cord set.



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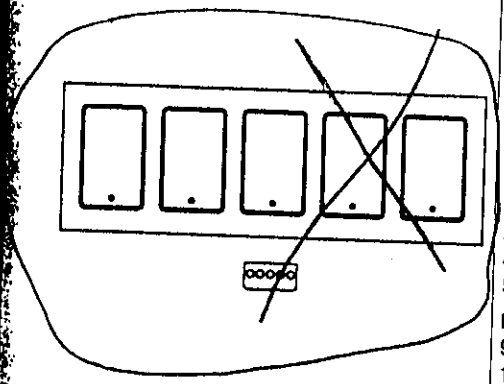
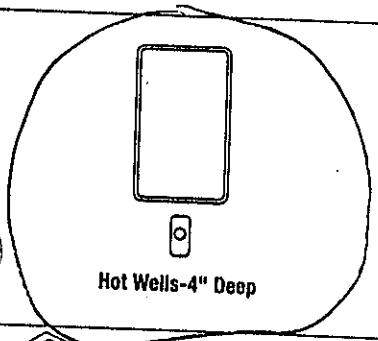
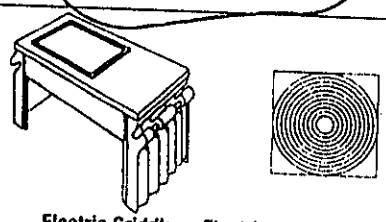
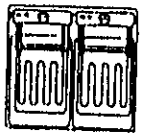
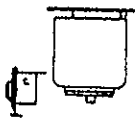
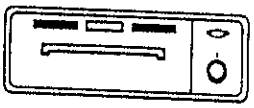
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

| Drop-In Accessories | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Extra Deep Hot Wells with Drains, Manifold and Individual Thermostats for Each Well - Wet or Dry | **Hot Wells - 6" Deep:** With thermostat controls and individual drains connected to manifold with drain valve and raised rim top. | Prices include complete installation in Galley module. | | | | | | | |
| | **Electric 120/60/1 1200W, 10 Amps Per Well - 5 Wells Require Direct Line. (No Cord & Plug).** | | | | | | | | |
| | 1 Well 6" Deep | 8920 | 35 | 8920 | 35 | 8920 | 35 | 8920 | 35 |
| | 2 Wells 6" Deep | Not Available | | 8921 | 70 | 8921 | 70 | 8921 | 70 |
| | 3 Wells 6" Deep | Not Available | | 8922 | 105 | 8922 | 105 | 8922 | 105 |
| | 4 Wells 6" Deep | Not Available | | Not Available | | 8923 | 140 | 8923 | 140 |
| | 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8924 | 175 |
| | **Electric 208/240/60/1 900W/1200W/4.3 Amps/5 Amps** | | | | | | | | |
| | 1 Well 6" Deep | 8925 | 35 | 8925 | 35 | 8925 | 35 | 8925 | 35 |
| | 2 Wells 6" Deep | Not Available | | 8926 | 70 | 8926 | 70 | 8926 | 70 |
| | 3 Wells 6" Deep | Not Available | | 8927 | 105 | 8927 | 105 | 8927 | 105 |
| | 4 Wells 6" Deep | Not Available | | Not Available | | 8928 | 140 | 8928 | 140 |
| | 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8929 | 175 |
|  Hot Wells-4" Deep | **Electric Hot Wells - 4" Deep:** With Infinite controls- **No Drains** | Prices include complete installation in Galley module. | | | | | | | |
| | **1 Well 4" Deep** | | | | | | | | |
| | 120V, 1Ph., 500W | 8829 | 35 | 8829 | 35 | 8829 | 35 | 8829 | 35 |
| | 208V, 1Ph., 500W | 8930 | 35 | 8930 | 35 | 8930 | 35 | 8930 | 35 |
| | 240V, 1Ph., 500W | 8931 | 35 | 8931 | 35 | 8931 | 35 | 8931 | 35 |
| | **Drains & Manifold for 9030 to 9054** | Not Available | | 8846 | 10 | 8848 | 15 | 8849 | 20 |
| | **Gas Hot Wells - 8"Deep & S/S Covered Rear panel** | Not Available | | 8984 | 120 | 8985 | 210 | 8986 | 240 |
|  Electric Griddle or Electric Char Broiler | **Electric Griddle** | | | | | | | | |
| | 25" Wide-208V/240V | Not Available | | 8728 | 132 | 8728 | 132 | 8728 | 132 |
| | 36.5" Wide-208V | Not Available | | 8729 | 187 | 8729 | 187 | 8729 | 187 |
| | 36.5" Wide-240V | Not Available | | 8730 | 187 | 8730 | 187 | 8730 | 187 |
| | **Electric Charbroiler** 25" Wide 208V | Not Available | | 8847 | 200 | 8847 | 200 | 8847 | 200 |
| | Installed in Side Skirt and Top: Specify Location- Right, Left or Center of Server. Bracing is Included. | | | | | | | | |
| Induction Cookers | **Induction Cookers 208/60/1 1800 Watt** | 8968 | 25 | 8968 | 25 | 8968 | 25 | 8968 | 25 |
|  Fry Kettle | **Single Well Fryer** 14 3/4" W. x 23 1/2" D. | 8832 | 36 | 8832 | 36 | 8832 | 36 | 8832 | 36 |
| | **Double Well Fryer** 24 13/16" W. x 23 7/8" D. | 8833 | 74 | 8833 | 74 | 8833 | 74 | 8833 | 74 |
| | | Prices include complete installation in Galley module. | | | | | | | |
|  Soup, Chili or Cereal Hot Well | **Round Warmers** | | | | | | | | |
| | 7 Qt. | 8841 | 26 | 8841 | 26 | 8841 | 26 | 8841 | 26 |
| | 11 Qt. | 8842 | 27 | 8842 | 27 | 8842 | 27 | 8842 | 27 |
| | Infinite Control Supplied | | | | | | | | |
| | Cook and Hold, 11 qt. | 8842C | 30 | 8842C | 30 | 8842C | 30 | 8842C | 30 |
|  Heated Drawer For 12"x20"x6" Pans | **Drawer Warmer** 450 Watts per Drawer **Single:** 29 1/4"W x 21 1/2"D x 14 7/8"H | Not Available | | 8839 | 89 | 8839 | 89 | 8839 | 89 |
| | **Double:** 29 1/4"W x 21 1/2"D x 25"H | Not Available | | 8840 | 175 | 8840 | 175 | 8840 | 175 |

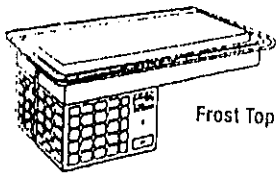
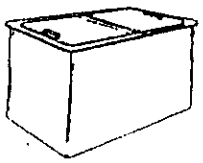
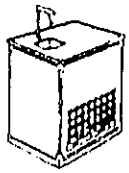
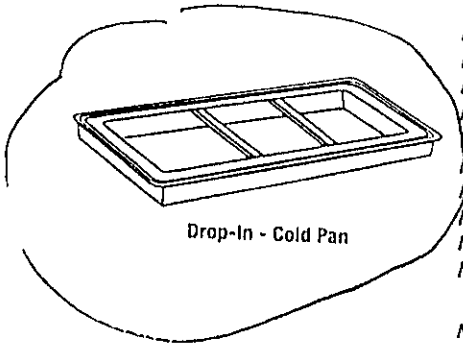
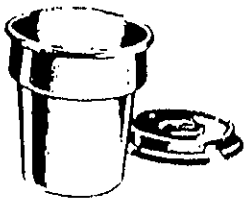
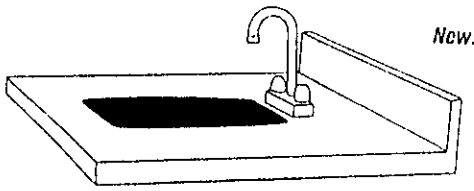
# Galley Line

ITEM #59

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Drop-In Accessories

| | Description | To Fit 20" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Frost Top | **Frost Top Sizes:** | | | | | | | | |
| | 22" x 22" | Not Available | | 8821 | 120 | 8821 | 120 | 8821 | 120 |
| | 42" x 22" | Not Available | | 8822 | 170 | 8822 | 170 | 8822 | 170 |
| | 58" x 22" | Not Available | | Not Available | | 8823 | 200 | 8823 | 200 |
| | 73" x 22" | Not Available | | Not Available | | Not Available | | 8824 | 225 |
| | | Prices include complete installation in Galley module. | | | | | | | |
|  Ice Chest No Refrigeration  Water Station with Self-Contained Refrigeration | Prices include complete installation in Galley module. | | | | | | | | |
| | **Ice Chest:** | | | | | | | | |
| | 13 1/2" x 17 1/4" | 8825 | 34 | 8825 | 34 | 8825 | 34 | 8825 | 34 |
| | 17 1/4" x 22 1/4" | 8826 | 55 | 8826 | 55 | 8826 | 55 | 8826 | 55 |
| | Cut out opening | | | | | | | | |
| | **Water Station:** | | | | | | | | |
| | 13 1/2" x 17 1/4" | 8827 | 100 | 8827 | 100 | 8827 | 100 | 8827 | 100 |
| | Cut out opening | | | | | | | | |
|  Drop-In - Cold Pan | **Cold Pans: 5" Deep** | | | | | | | | |
| | *New!* 1 Well - No Refrig. | 8828 | 30 | 8828 | 30 | 8828 | 30 | 8828 | 30 |
| | *New!* 2 Wells - No Refrig. | Not Available | | 8889 | 60 | 8889 | 60 | 8889 | 60 |
| | *New!* 3 Wells - No Refrig. | Not Available | | 8890 | 90 | 8890 | 90 | 8890 | 90 |
| | *New!* 4 Wells - No Refrig. | Not Available | | Not Available | | 8891 | 120 | 8891 | 120 |
| | *New!* 5 Wells - No Refrig. | Not Available | | Not Available | | Not Available | | 8892 | 150 |
| | *New!* 1 Well with Refrig. | 8885 | 180 | 8885 | 180 | 8885 | 180 | 8885 | 180 |
| | *New!* 2 Wells with Refrig. | Not Available | | 8911 | 200 | 8911 | 200 | 8[illegible] | 200 |
| | *New!* 3 Wells with Refrig. | Not Available | | 8886 | 210 | 8886 | 210 | 8[illegible] | 210 |
| | *New!* 4 Wells with Refrig. | Not Available | | Not Available | | 8887 | 240 | 8[illegible] | 240 |
| | *New!* 5 Wells with Refrig. | Not Available | | Not Available | | Not Available | | 8888 | 270 |
| | **Cold Pans: 10" Deep** | | | | | | | | |
| | *New!* 1 Well - No Refrig. | 8828A | 30 | 8828A | 30 | 8828A | 30 | 8828A | 30 |
| | *New!* 2 Wells - No Refrig. | Not Available | | 8889A | 60 | 8889A | 60 | 8889A | 60 |
| | *New!* 3 Wells - No Refrig. | Not Available | | 8890A | 90 | 8890A | 90 | 8890A | 90 |
| | *New!* 4 Wells - No Refrig. | Not Available | | Not Available | | 8891A | 120 | 8891A | 120 |
| | *New!* 5 Wells - No Refrig. | Not Available | | Not Available | | Not Available | | 8892A | 150 |
| | *NSF-7 New!* 1 Well with Refrig. | 8987 | 180 | 8987 | 180 | 8987 | 180 | 8987 | 180 |
| | *NSF-7 New!* 2 Wells with Refrig. | Not Available | | 8988 | 200 | 8988 | 200 | 8988 | 200 |
| | *NSF-7 New!* 3 Wells with Refrig. | Not Available | | 8989 | 210 | 8989 | 210 | 8989 | 210 |
| | *NSF-7 New!* 4 Wells with Refrig. | Not Available | | Not Available | | 8990 | 240 | 8990 | 240 |
| | *NSF-7 New!* 5 Wells with Refrig. | Not Available | | Not Available | | Not Available | | 8991 | 270 |
| | | Prices include complete installation in Galley module. | | | | | | | |
| | | Insulated Stainless Steel Cold Pan with Drain Hose, Shut Off Valve and White ABS Drain Base for Ice. | | | | | | | |
|  Inserts Pans, Stainless Steel | *New!* *New!* Flat Hot Well Cover Pizza & Sheet Pan Adapter | 8800 | 3 | 8800 | 3 | 8800 | 3 | 8800 | 3 |
| | *New!* 7 Quart Round Insert with Cover | 8844 | 3 | 8844 | 3 | 8844 | 3 | 8844 | 3 |
| | 12" x 20" x 4" Rectangular Food Pan | 8845 | 3 | 8845 | 3 | 8845 | 3 | 8845 | 3 |
|  Sink and Faucet (Shown with Optional Backsplash) | *New!* Stainless Steel Sink with Strainer and Gooseneck Faucet | 8880 | 55 | 8880 | 55 | 8880 | 55 | 8880 | 55 |



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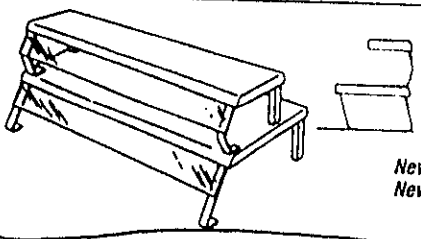
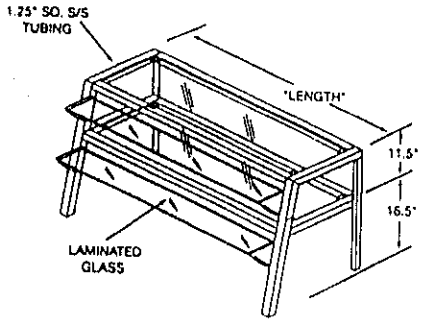
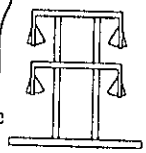
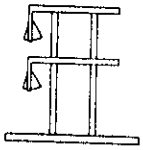
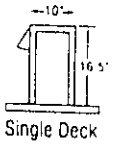
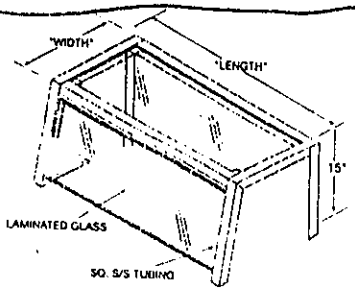
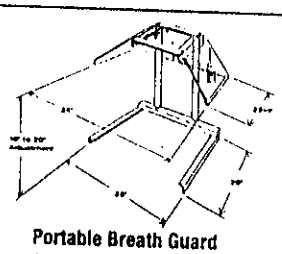
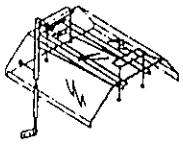
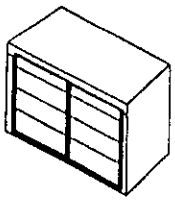
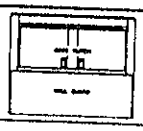
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

| Food Protectors | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  New! New! Double Deck Display, Solid Shelves | **Pewter Tan, Dove White or Black Pearl Shelves:** | | | | | | | | |
| | Unlighted | 8797 | 92 | 8785 | 97 | 8786 | 103 | 8787 | 108 |
| | Lighted | 8819 | 107 | 8788 | 112 | 8789 | 118 | 8790 | 124 |
| | **Stainless Steel Shelves:** | | | | | | | | |
| | Unlighted | 8646 | 92 | 8647 | 97 | 8648 | 103 | 8649 | 108 |
| | Lighted | 8749 | 107 | 8795 | 112 | 8798 | 118 | 8799 | 124 |
| | Safety Glass | 8628 | 50 | 8629 | 75 | 8630 | 106 | 8631 | 125 |
| | **Replacement Items:** | | | | | | | | |
| | Breath Guard | 7002321 - 2 Required | | 7001172 - 2 Required | | 7001173 - 4 Required | | 7001173 - 4 Required | |
|   Double Deck Glass Display (Single Service Shown) | **Double Deck Glass Shelves and Adjustable Glass Breath Protector** | | | | | | | | |
| | Single Service, Unlighted | 8616 | 192 | 8617 | 197 | 8618 | 203 | 8619 | 208 |
| | Double Service, Unlighted | 8632 | 210 | 8633 | 212 | 8634 | 218 | 8684 | 224 |
| | Single Service, Lighted | 8970 | 202 | 8971 | 217 | 8972 | 223 | 8978 | 228 |
| | Double Service, Lighted | 8974 | 220 | 8975 | 232 | 8976 | 238 | 8977 | 244 |
| | Single Deck, Glass Shelf and Adjustable Glass Breath Protector Unlighted | 8517 | 100 | 8518 | 115 | 8519 | 130 | 8520 | 145 |
| | |  Double Service | | |  Single Service | |   Single Deck | |
|   Single Deck Glass Protector | **Single Deck Glass Top Food Protector** Unlighted | 8904 | 140 | 8905 | 150 | 8906 | 162 | 8907 | 174 |
| | **Single Deck Stainless Steel Top Food Protector** | | | | | | | | |
| | Unlighted | 8932 | 120 | 8933 | 130 | 8934 | 142 | 8935 | 154 |
| | Lighted | 8936 | 135 | 8937 | 145 | 8938 | 157 | 8939 | 169 |
| | **Verticle Glass Protectors** Up to 28" High in Stainless Frame | 8913 | 100 | 8914 | 110 | 8915 | 120 | 8916 | 130 |
| | **For Corners** | 8917 | 125 | | | | | | |
|  New! Portable Breath Guard Vertical adjustment to 20" | **Portable Breath Guard Unlighted;** For use on 9011,9012, 9310, etc. | 8724 | 70 | 8724 | 70 | 8724 | 70 | 8724 | 70 |
| | **Corner Breath Guard** Fixed, Unlighted; | 8720 | 70 |  | | | | | |
| | **Replacement Items:** | | | | | | | | |
| | Breath Guard | 7001771 | | 7001771 | | 7001771 | | 7001771 | |
| | Knurled Knobs | 2502033 - 4 Required | | 2502033 - 4 Required | | 2502033 - 4 Required | | 2502033 - 4 Required | |
|  erated Display Merchandiser Pass Thru / See Thru | **Pass Thru / See Thru Refrigerated Display Merchandisers** Sliding Glass Doors on both sides. Prices include complete installation in Galley Module. Compressor Mounted in Module Base. | Not Available **Refrigerated Base with Compressor** | | 8908 550 Not Available 1/2 HP 12 Amps 115 / 60 / 1 | | 8909 675 8982 250 3/4 HP 16 Amps 115 / 60 / 1 | | 8910 825 8983 275 3/4 HP 16 Amps 115 / 60 / 1 | |
|  | **Over Counter Wall Hutch with** Doors, Shelves & Wall Guard All S/S | 8960 | 250 | 8961 | 350 | 8962 | 400 | 8963 | 450 |



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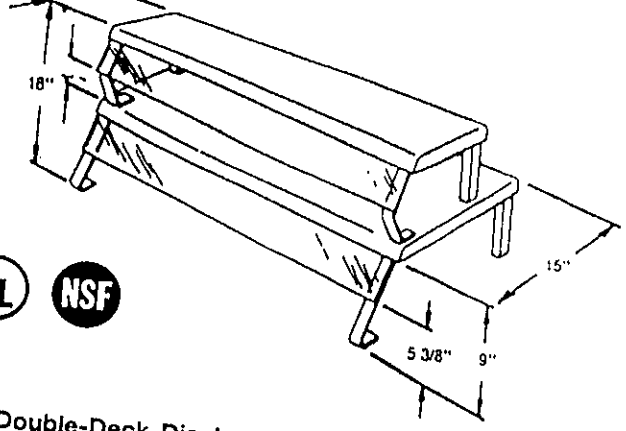
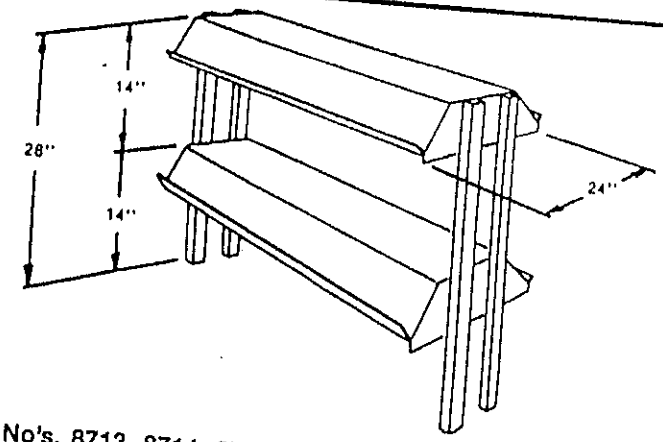
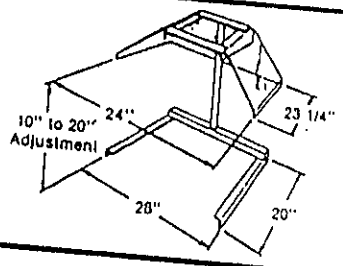


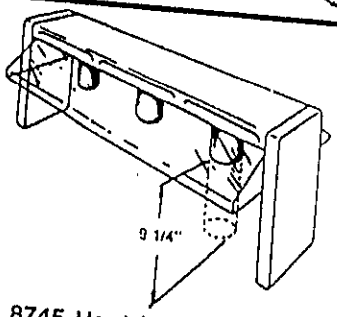

☐ **Double-Deck Display Stand.** To be full width x 18"H x 15"D (overall). To be one of two neutral colors, dove white or pewter tan. Shelving to be of ABS plastic material and supported by two contoured stainless steel uprights. Bottom shelf to be 15"D. Top shelf to be 9" D. Top and bottom acrylic "see-thru" plastic breathguards are easily removable for cleaning. Available on all Cold Pan, Refrigerated Cold Pan and Utility Table Modules.




☐ **No's. 8713, 8714, 8722 Merchandising Shelf.** Stainless steel construction. Designed to be used with baskets or pans.

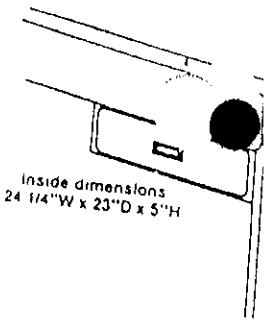
☐ **No. 8724 Portable Breathguard.** Portable free-standing acrylic breathguard. Is adjustable and has a stainless steel frame. Fits on 28" Module.

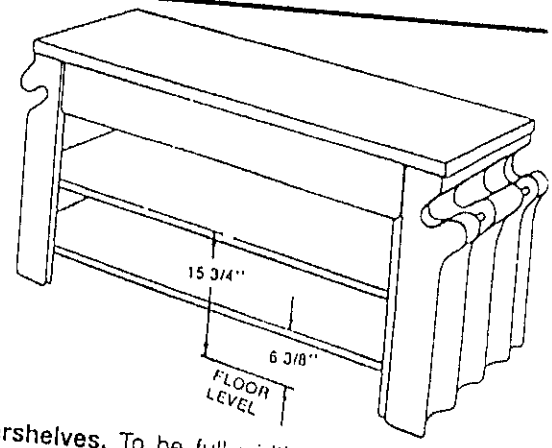



☐ **No's. 8743, 8744, 8745 Heat Lamps Canopy.** Available for 50", 64 ½" and 79" modules in lieu of the standard fluorescent lamp canopy. Each canopy lamp is independently controlled and uses 125 watt bulbs. Canopy size: 24" x 28" x full width.

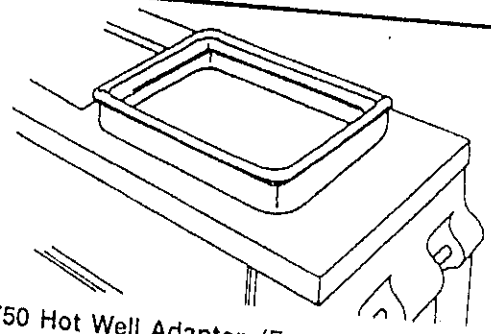
☐ **No. 8760 Utility Drawer.** To be all stainless steel construction and to include lock and removable plastic liner. Outside dimensions are 24 ¼"W x 23"D x 5¼"H. Inside dimensions are 24 ½"W x 23"D x 5"H. Factory installed. Available on Hot Food, Cold Pan, and Utility Table Modules (except Model 9310).



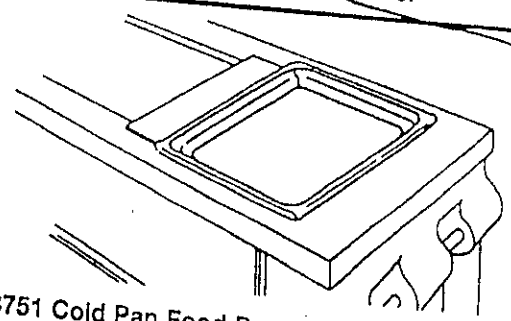




☐ **Undershelves.** To be full width of module interior x 1 deep with 1" turned-down front edge. To be all stainless ste and easy to remove. Maximum: two shelves per module Lower shelf to be 6 ⅜" from floor and upper shelf 5 from the floor. Available on Hot Food, Cold Pan, Refrigerate Cold Pan, and Utility Table Modules. Specify by width, catalo number and specify quantity.

Two sets of shelf brackets are installed in case shelves are ordered later.



☐ **No. 8750 Hot Well Adapter.** (For using 6" deep pans in top cutouts of hot food table modules). To be 20 ga. stainless steel. Approximate dimensions: 12 ½" x 20 ½" x 2". A ½" lip projects into food well to keep collar in place.



☐ **No. 8751 Cold Pan Food Pan Adapter Bar.** For use with 12" x 20" pans in both cold or refrigerated cold pan modules for covering top opening.



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# Galley® Line

ITEM #59

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Drop-In Accessories

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Hot Wells - 6" Deep:** With thermostat controls and individual drains connected to manifold with drain valve and raised rim top. | Prices include complete installation in Galley module. | | | | | | | |
| **Electric 120/60/1 1200W, 10 Amps Per Well - 5 Wells Require Direct Line. (No Cord & Plug).** | | | | | | | | |
| 1 Well 6" Deep | 8920 | 35 | 8920 | 35 | 8920 | 35 | 8920 | 35 |
| 2 Wells 6" Deep | Not Available | | 8921 | 70 | 8921 | 70 | 8921 | 70 |
| 3 Wells 6" Deep | Not Available | | 8922 | 105 | 8922 | 105 | 8922 | 105 |
| 4 Wells 6" Deep | Not Available | | Not Available | | 8923 | 140 | 8923 | 140 |
| 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8924 | 175 |
| **Electric 208/240/60/1 900W/1200W/4.3 Amps/5 Amps** | | | | | | | | |
| 1 Well 6" Deep | 8925 | 35 | 8925 | 35 | 8925 | 35 | 8925 | 35 |
| 2 Wells 6" Deep | Not Available | | 8926 | 70 | 8926 | 70 | 8926 | 70 |
| 3 Wells 6" Deep | Not Available | | 8927 | 105 | 8927 | 105 | 8927 | 105 |
| 4 Wells 6" Deep | Not Available | | Not Available | | 8928 | 140 | 8928 | 140 |
| 5 Wells 6" Deep | Not Available | | Not Available | | Not Available | | 8929 | 175 |

**Extra Deep Hot Wells with Drains, Manifold and Individual Thermostats for Each Well - Wet or Dry**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Electric Hot Wells - 4" Deep:** With Infinite controls- **No Drains** | Prices include complete installation in Galley module. | | | | | | | |
| **1 Well 4" Deep** | | | | | | | | |
| 120V, 1Ph., 500W | 8829 | 35 | 8829 | 35 | 8829 | 35 | 8829 | 35 |
| 208V, 1Ph., 500W | 8930 | 35 | 8930 | 35 | 8930 | 35 | 8930 | |
| 240V, 1Ph., 500W | 8931 | 35 | 8931 | 35 | 8931 | 35 | 8931 | |
| **Drains & Manifold for 9030 to 9054** | Not Available | | 8846 | 10 | 8848 | 15 | 8849 | 20 |
| **Gas Hot Wells - 8"Deep & S/S Covered Rear panel** | Not Available | | 8984 | 120 | 8985 | 210 | 8986 | 240 |

**Hot Wells-4" Deep**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Electric Griddle** | | | | | | | | |
| 25" Wide–208V/240V | Not Available | | 8728 | 132 | 8728 | 132 | 8728 | 132 |
| 36.5" Wide–208V | Not Available | | 8729 | 187 | 8729 | 187 | 8729 | 187 |
| 36.5" Wide–240V | Not Available | | 8730 | 187 | 8730 | 187 | 8730 | 187 |
| **Electric Charbroiler** 25" Wide 208V | Not Available | | 8847 | 200 | 8847 | 200 | 8847 | 200 |
| **Induction Cookers 208/60/1 1800 Watt** | 8968 | 25 | 8968 | 25 | 8968 | 25 | 8968 | 25 |

Installed in Side Skirt and Top: Specify Location– Right, Left or Center of Server. Bracing is Included.

**Electric Griddle or Electric Char Broiler**
**Induction Cookers**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Single Well Fryer** 14 3/4" W. x 23 1/2" D. | 8832 | 36 | 8832 | 36 | 8832 | 36 | 8832 | 36 |
| **Double Well Fryer** 24 13/16" W. x 23 7/8" D. | 8833 | 74 | 8833 | 74 | 8833 | 74 | 8833 | 74 |

Prices include complete installation in Galley module.

**Fry Kettle**

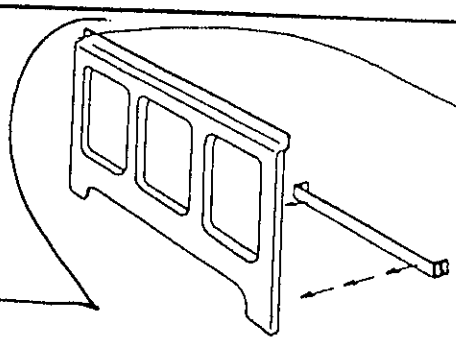
| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Round Warmers** 7 Qt. | 8841 | 26 | 8841 | 26 | 8841 | 26 | 8841 | 26 |
| 11 Qt. | 8842 | 27 | 8842 | 27 | 8842 | 27 | 8842 | 27 |
| Infinite Control Supplied | | | | | | | | |
| Cook and Hold, 11 qt. | 8842C | 30 | 8842C | 30 | 8842C | 30 | 8842C | 30 |

**Soup, Chili or Cereal Hot Well**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Drawer Warmer** 450 Watts per Drawer **Single:** 29 1/4" W x 21 1/2" D x 14 7/8" H | Not Available | | 8839 | 89 | 8839 | 89 | 8839 | 89 |
| **Double:** 29 1/4" W x 21 1/2" D x 25" H | Not Available | | 8840 | 175 | 8840 | 175 | 8840 | 175 |

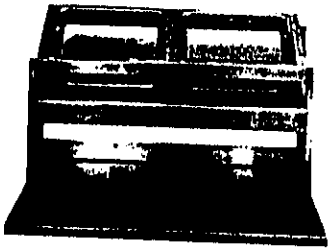
**Heated Drawer For 12"x20"x6" Pans**

☐ **No. 8723 Divider Tray.** 17½" x 19 1/16" aluminum tray to hold milk cartons, shakes, dixie cups and other products in a ·gerated unit.



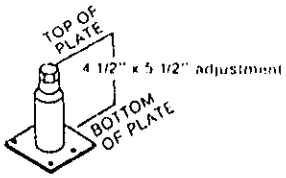
☐ **~~No's. 8733, 8734, 8735,~~ 8736 Close-Off Back Panel.** Material to be of flame retardant ABS formed plastic. Removable close-off side panel to be recessed too accept decorator panels.

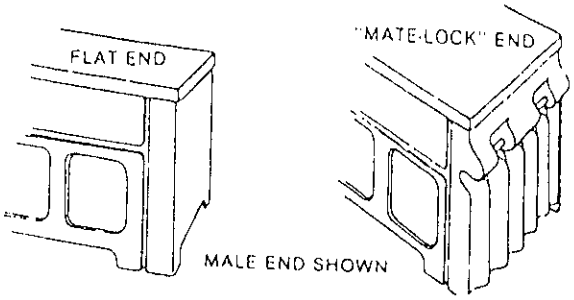
☐ **No's. 8960, 8961, 8962, 8963 Wall Hutch.** Material to be #4 polish stainless steel with stainless steel doors, recessed latches, locks & keys, stainless steel wall guard, and stainless steel shelves.



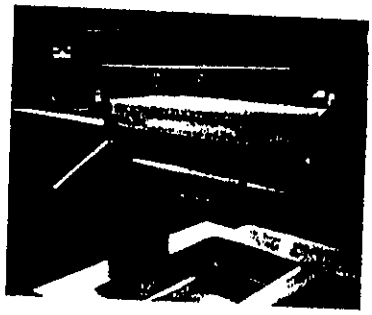
☐ **No's. 8624, 8625, 8626, 8627 Recessed & Angled Display Shelves.** Material to be #4 polish stainless steel with slanted shelves with cut outs for food service pans. May be mounted back to back for double service.

☐ **No. 8783 Bullet Feet** (Set of 4). Pr· ·metal legs with 1" adjust- n ·ed in lieu of casters.

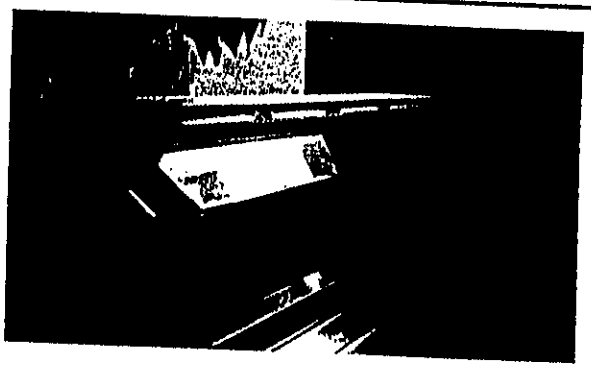


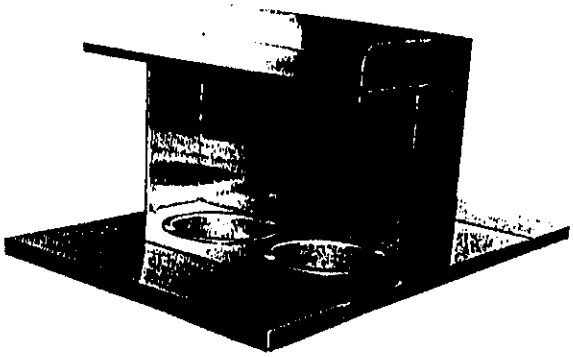

☐ **No's. 8731, 8732 Flat End Panel** (Replaces Male/Female "Matelock"). Neutral colors, dove white, pewter tan or black pearl. Made of flame retardant ABS formed plastic material. Panel allows for squaring end of module to wall where necessary. 8731 fits female. 8732 fits male.



☐ **No's. 8639, 8640, 8641 Safety Glass** framed in stainless steel in lieu of Plastic for heat lamp canopy and **No. 8978 Lift Up Option.**



☐ **No's. 8895, 8897, 8898, 8899 Safety Glass** framed in stainless steel in lieu of Plastic for lighted buffet canopies.



☐ **No's. 8719, 8943 Soup Cup Shelf.** Stainless steel with side walls & rear wall cup retainers. Shown with optional plate rests and soup wells.



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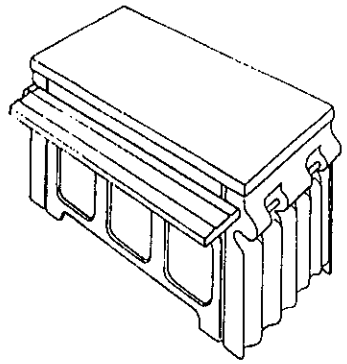
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

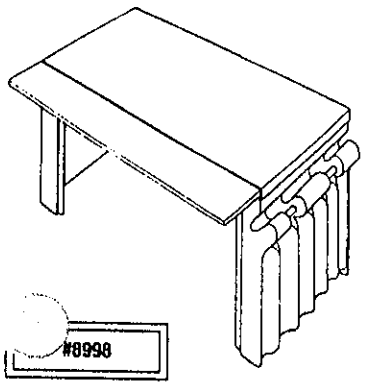
## Accessories



Trayslides (8774 Shown)

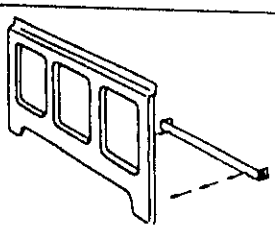
| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28" - Short 20 7/8" | | Full 50" - Short 42 7/8" | | Full 64.5" - Short 57 3/8" | | Full 79" - Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| New! 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029



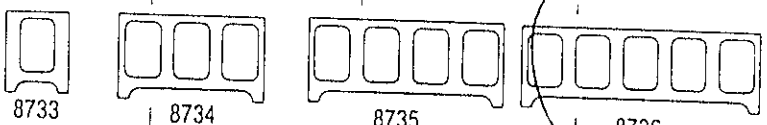
Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28" - Short 20 7/8" | | Full 50" - Short 45 7/8" | | Full 64.5" - Short 60 3/8" | | Full 79" - Short 74 7/8" | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843. | | | | | | | | |
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

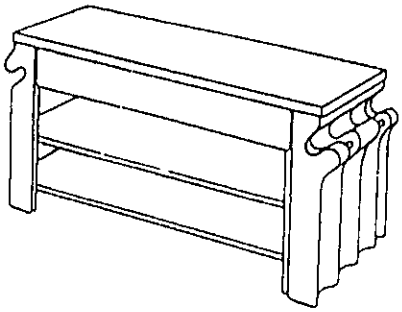


Closure and Access Panel (8734 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)
Interior Stainless End Liners (Not Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. Note: #9230, #9231, & #9630 cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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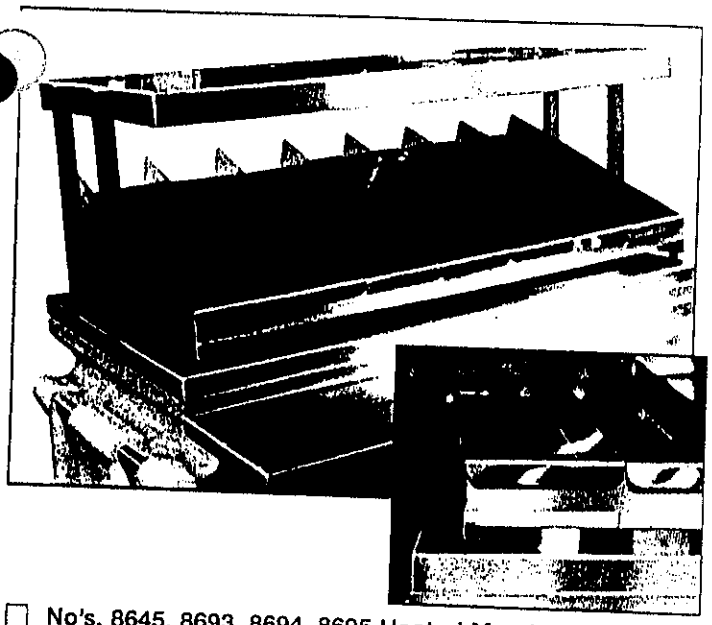
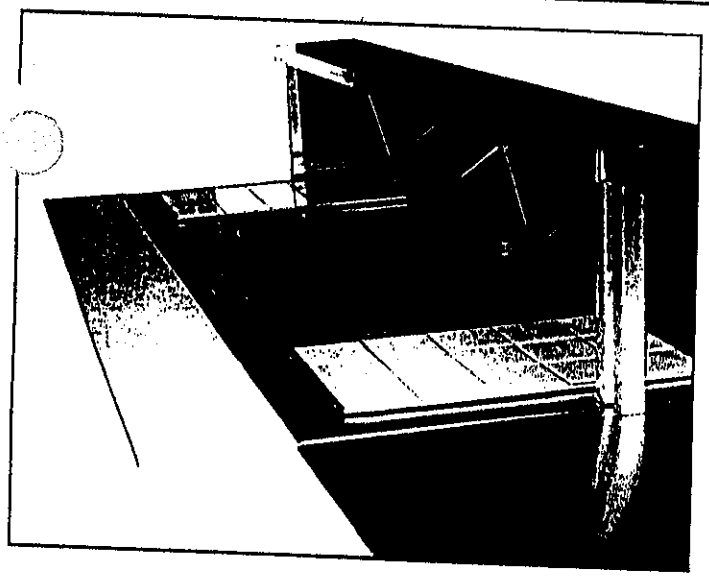


☐ **No's. 8645, 8693, 8694, 8695 Heated Merchandiser.** For hot sandwiches & french fries. Display shelf with infrared heat under top shelf & mounted to module top. Gravity feed bag chutes are stainless steel and lift up for cleaning.

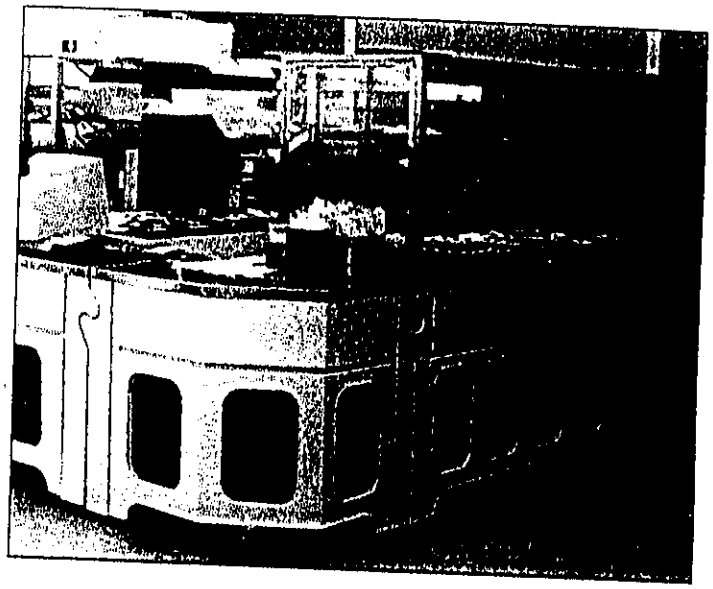


☐ **No's. 8932, 8933, 8934, 8935 Stainless Steel Top Food Protector.** Unlighted safety glass front.

☐ **No's. 8936, 8937, 8938, 8939 Stainless Steel Top Food Protector.** Lighted safety glass front.

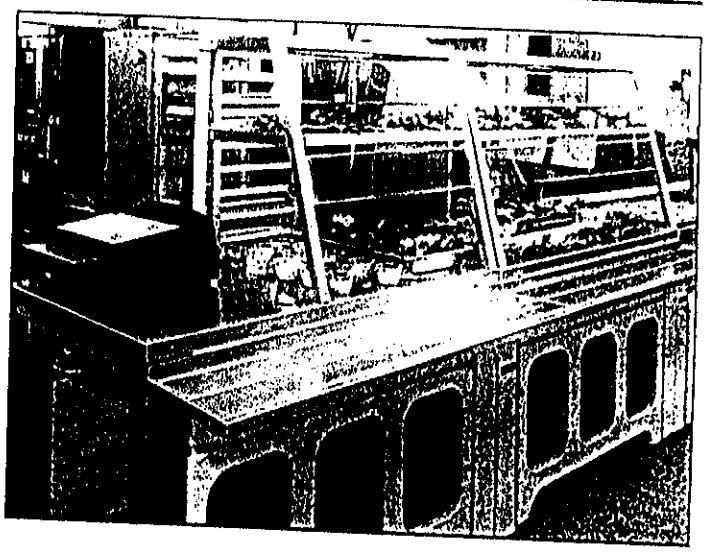
☐ **No's. 8712, 8763, 8764, 8765 Folding Drop Down Cutting Board or Work Surface.** 8" x 1" white Poly removable for cleaning.

☐ **No. 8968 Induction Cookers.** (3 shown) Dropped into module and wired to junction box.

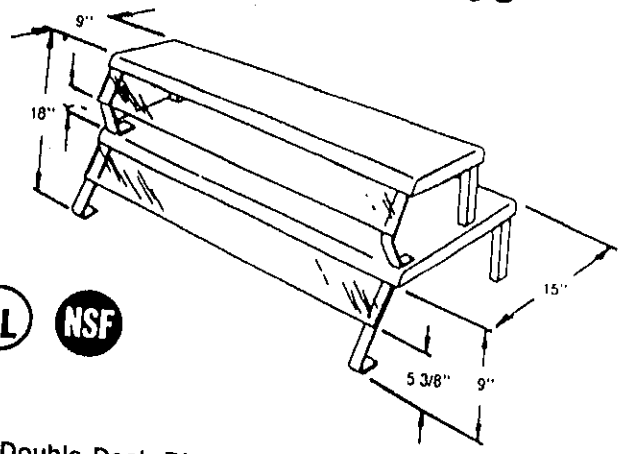


☐ **No's. 8913, 8914, 8915, 8916, 8917 Vertical Glass Protectors.** 28" high safety glass in a stainless steel frame.

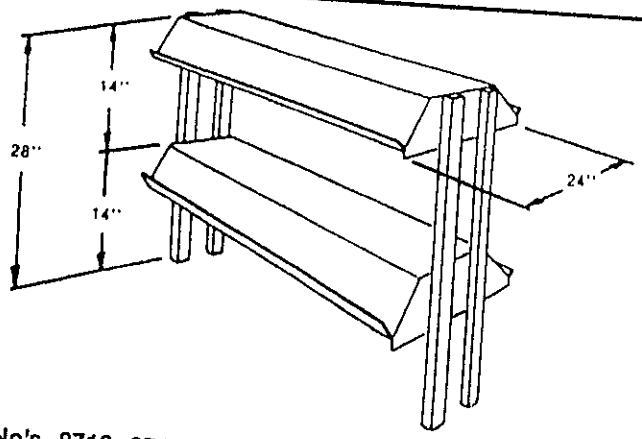
☐ **No's. 8721, 8722, 8713, 8714, 8900, 8901, 8902, 8903 Angled Stainless Steel Display with Slanted Shelves.** With or without optional heat lamps 8992, 8992A, 8992B, 8992C.



☐ **No's. 8616, 8617, 8618, 8619, 8632, ~~8633, 8634, 8684,~~ 8970, 8971, 8972, 8973, 8974, 8975, ~~8976,~~ 8977 Double Deck Displays with Stainless Steel Uprights.** Saftey glass and adjustable stainless steel food protectors all framed with stainless steel.

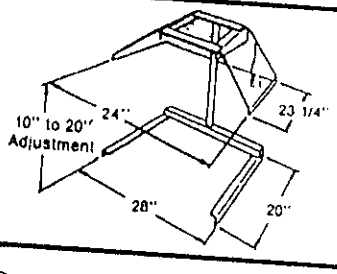


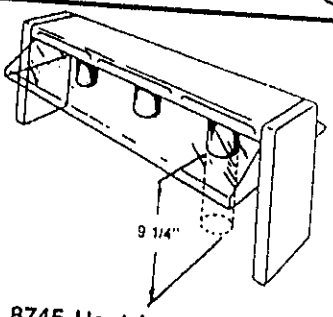

☐ **Double-Deck Display Stand.** To be full width x 18"H x 15"D (overall). To be one of two neutral colors, dove white or pewter tan. Shelving to be of ABS plastic material and supported by two contoured stainless steel uprights. Bottom shelf to be 15"D. Top shelf to be 9" D. Top and bottom acrylic "see-thru" plastic breathguards are easily removable for cleaning. Available on all Cold Pan, Refrigerated Cold Pan and Utility Table Modules.




☐ **No's. 8713, 8714, 8722 Merchandising Shelf.** Stainless steel construction. Designed to be used with baskets or pans.

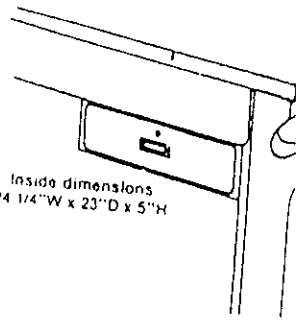
☐ **No. 8724 Portable Breathguard.** Portable free-standing acrylic breathguard. Is adjustable and has a stainless steel frame. Fits on 28" Module.

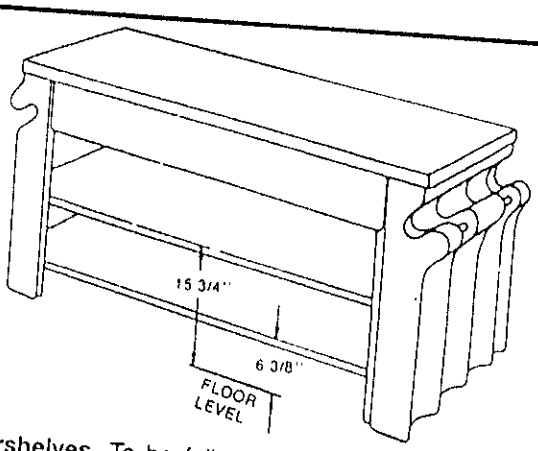



☐ **No's. 8743, 8744, 8745 Heat Lamps Canopy.** Available [illegible] 50", 64 ½" and 79" modules in lieu of the standard fluores[illegible] lamp canopy. Each canopy lamp is independently con[illegible]olled and uses 125 watt bulbs. Canopy size: 24" x 28" x full width.

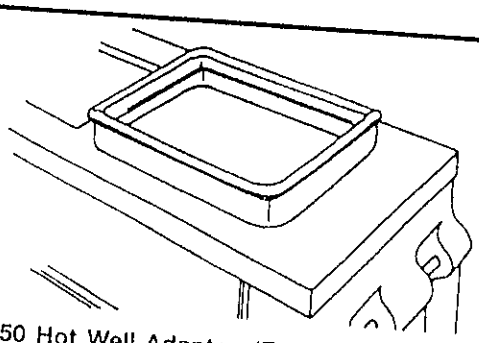
☐ **No. 8760 Utility Drawer.** To be all stainless steel construction and to include lock and removable plastic liner. Outside dimensions are 24 ¼"W x 23"D x 5¼"H. Inside dimensions are 24 ½"W x 23"D x 5"H. Factory installed. Available on Hot Food, Cold Pan, and Utility Table Modules (except Model 9310).



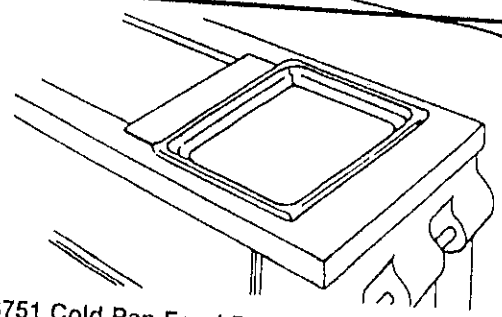




☐ **Undershelves.** To be full width of module interior x 18" deep with 1" turned-down front edge. To be all stainless steel and easy to remove. Maximum: two shelves per module. Lower shelf to be 6 ⅜" from floor and upper shelf to be 15 ¾" from the floor. Available on Hot Food, Cold Pan, Refrigerated Cold Pan, and Utility Table Modules. Specify by width, catalog number and specify quantity.

Two sets of shelf brackets are installed in case shelves are ordered later.



☐ **No. 8750 Hot Well Adapter.** (For using 6" deep pans in top cutouts of hot food table modules). To be 20 ga. stainless steel. Approximate dimensions: 12 ½" x 20 ½" x 2". A ½" lip projects into food well to keep collar in place.



☐ **No. 8751 Cold Pan Food Pan Adapter Bar.** For use with 12" x 20" pans in both cold or refrigerated cold pan modules for covering top opening.



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# Galley® Line

Item No. #63

## Sanitary, Heavy Duty
## Self-Service 10" Deep
## Refrigerated Cold Pan Module
## NSF Standard 7 Version

**Model No. 9630**
**Model No. 9640**
**Model No. 9650**

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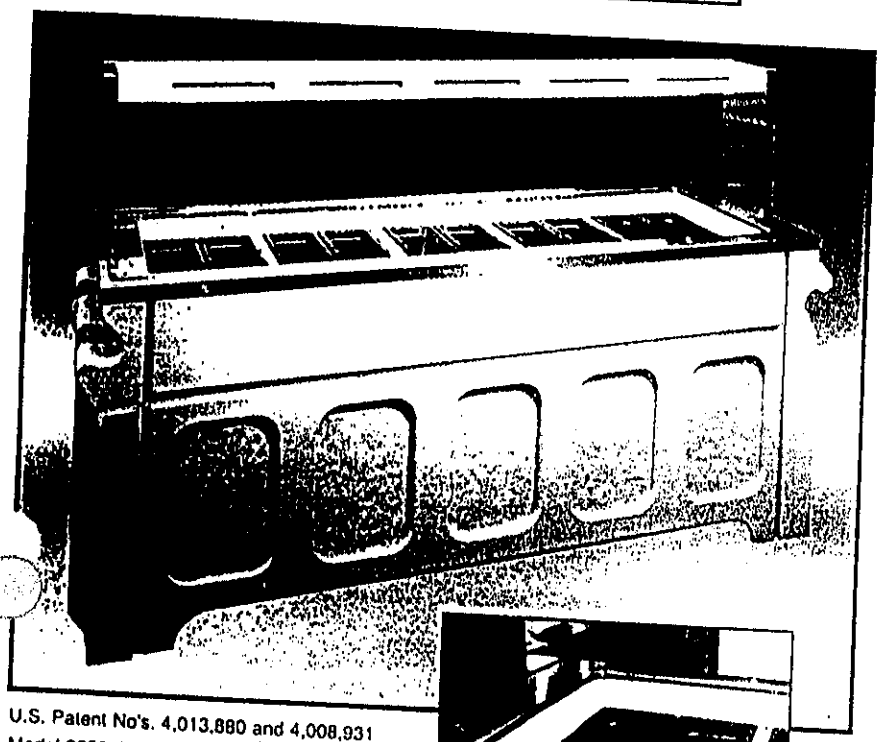
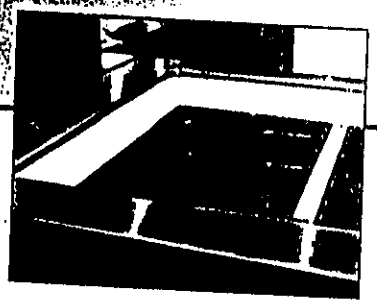


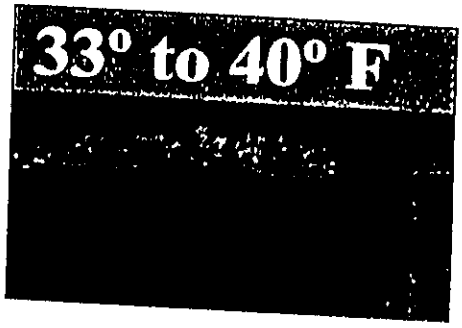


U.S. Patent No's. 4,013,880 and 4,008,931
Model 9650, 79" width module shown with optional buffet canopy #8742

NSF

THE GALLEY PORTAFROST – Ideal for self-service foods that must refrigerated at a constant 33°F. Used for salads, cold desserts, milk shakes, cold cuts, cheeses, spreads, juices, fresh fruits and melons. Ten-inch deep cold pan provides a 3" cold blanket which keeps the hot air out and foods between 33°F and 40°F.

- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.
- Aesthetic design, three neutral colors, dove white, pewter tan or black pearl, blends in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.




| Cat. No. | Module Size W | Module Size D | Module Size H | Pan Size W | Pan Size D | Pan Size H | Volts | Amps | Phase | Comp. H.P. | Hz | Quantity of Decorator Panels Included | Shpg. Wt. Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9630 | 50" | 28" | 36" | 41" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 3 | 310 |
| 9640 | 64 7/8" | 28" | 36" | 55 7/8" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 4 | 364 |
| 9650 | 79" | 28" | 36" | 70" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 5 | 418 |

All models 1/4 Horsepower. Includes removable drain bases.

To be **Galley® Line** 10" Deep Refrigerated Cold Pan Unit, Model _____ with accessories as specified.

**GENERAL:** Unit to be self-contained, stainless steel, mobile self-service 10" deep Refrigerated Cold Pan module for refrigerator temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-lock- and aligning end panels allow modules to be interconnected. To e recessed push handles at each end. Side skirts to be remov- for access to compressor and controls. Side skirts to be essed to accept decorator panels. Server's side to be open to accept accessories. To be listed by National Sanitation Foundation.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal under-carriage. 14 ga. 300 series stainless steel top to have not less than #4 finish. Optional Buffet canopy contains fluorescent light. One-piece acrylic breath-guard is removable. Canopy is supported by stainless steel uprights and covered with flame retardant ABS formed plastic. To have removable white low gloss ABS plastic drain base. Cold pan drain to include hose and shut-off. Insulated cold pan to be constructed of 300 series stainless steel and shall be 10" deep. The pans are to be set on a ledge 3" below the top surface and surrounded with frost. The cold pan refrigeration system to be a 1/4 h.p. hermetically sealed condensing unit. Condensing unit to be fully enclosed in a corrosion resistant ventilated housing. Plate mounted 4" diameter swivel casters with toe brakes to be provided. Power supply cord to be 6 feet in length. NEMA plug configuration to be 5-15P. To be used with a branch circuit rating of 15 amps, single pole. Power supply cord to be 14 AWG, 3 conductors.

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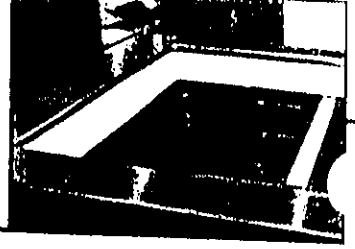
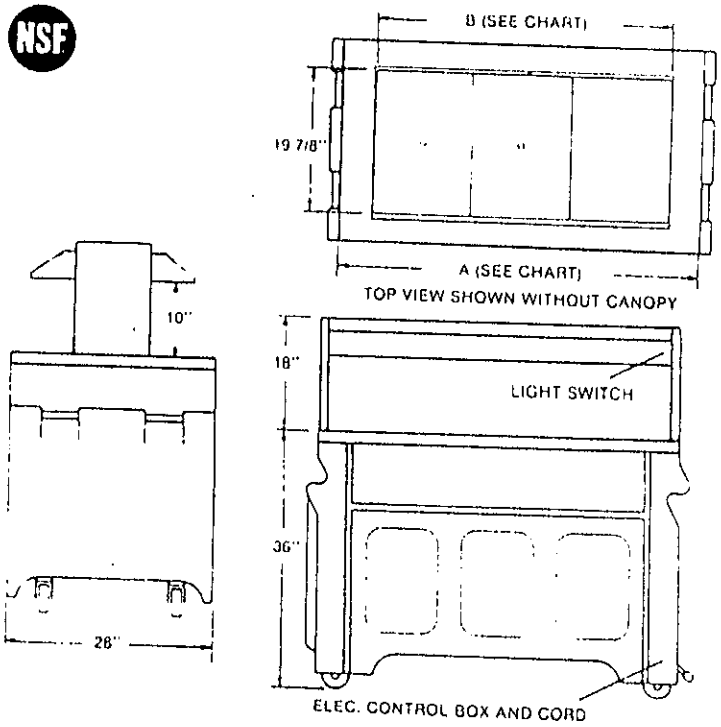
# Galley® Line

## 10" Deep Refrigerated Cold Pan Module
## NSF Standard 7 Version Model No's 9630, 9640, 9650



SPECIFICATION DRAWING OF BASIC UNIT WITH BUFFET CANOPY




| Cat. No. | Dim 'A' | Dim 'B' |
|---|---|---|
| 9630 | 50" | 41" |
| 9640 | 64 ½" | 55 ½" |
| 9650 | 79" | 70" |

NOTE: If unit is to be used independently, add 4" to width for clearance on all specifications.

ACCESSORIES:

. Decorator panels, specify catalog number and quantity. (See chart on front side.)
] Catalog No. 8700 American Walnut, Quantity_____ Included.
] Catalog No. 8701 Teakwood, Quantity_____.
] Catalog No. 8702 Plain Custom Panel, Quantity_____.
] Catalog No. 87xx Custom Laminate, Quantity_____.

. Food Bar Adapters. Adapter bar for use when 12 x 20 pans are placed in cold pan to cover top opening.
] Catalog No. 8751. Model 9630 requires two. Model 9640 requires three. Models 9650 requires four. Quantity_____.

Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
] Catalog No. 8773, (*Short 50") 42 7/8" width, used on 9231.
☐ Catalog No. 8774, 50" width, used on model 9231.
☐ Catalog No. 8775, (*Short 64 ½") 57 7/8" width, used on 9241.
☐ Catalog No. 8776, 64 ½" width, used on model 9641.
☐ Catalog No. 8777, (*Short 79") 71 7/8" width, used on 9651.
☐ Catalog No. 8778, 79" width, used on model 9651.

*Note: A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

D. Folding Cutting Board. All plastic. Mounted flush on server's side.
☐ Catalog No. 8763, 50" width, used on model 9231.
☐ Catalog No. 8764, 64 ½" width used on model 9241.
☐ Catalog No. 8765, 79" width used on model 9251.

E. Extension shelf. Stainless steel. Mounted flush with top of module. Self-mounting. 16" wide x 28" deep.
☐ Catalog No. 8754.

F. "Mateflat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5 7/8"W x 28"D x 36"H.
☐ Catalog No. 8761. Male panel (fits female end).
☐ Catalog No. 8762. Female panel (fits male end).

G. Food Protector.
☐ Catalog No. 8780, use with 50" width unit.
☐ Catalog No. 8781, use with 64 ½" width unit.
☐ Catalog No. 8782, use with 79" width unit.

H. Food Protector with Lights.
☐ Catalog No. 8791, use with 50" width unit.
☐ Catalog No. 8792, use with 64 ½" width unit.
☐ Catalog No. 8793, use with 79" width unit.

I. Double Deck Display Stand without lights.
☐ Catalog No. 8785, use with 50" width unit.
☐ Catalog No. 8786, use with 64 ½" width unit.
☐ Catalog No. 8787, use with 79" width unit.

J. Double Deck Display Stand with Lights.
☐ Catalog No. 8788, use with 50" width unit.
☐ Catalog No. 8789, use with 64 ½" width unit.
☐ Catalog No. 8790, use with 79" width unit.

K. Flat End Panel.
☐ Catalog No. 8731 Replaces Female "matelock"
☐ Catalog No. 8732 Replaces Male "matelock"

L. Buffet Style Canopy.
☐ Catalog No. 8740, use with 50" width unit.
☐ Catalog No. 8741, use with 64 ½" width unit.
☐ Catalog No. 8742, use with 79" width unit.

M. Close Off for server's side.
☐ 8734, use with 50" width unit.
☐ 8735, use with 64 ½" width unit.
☐ 8736, use with 79" width unit.

N. Undercounter Shelving.
☐ Catalog No. 8752 Only used on 9640.
☐ Catalog No. 8757 Only used on 9650.

No other undershelves can be used on refrigerated modules.

**Specifications subject to change without notice.**



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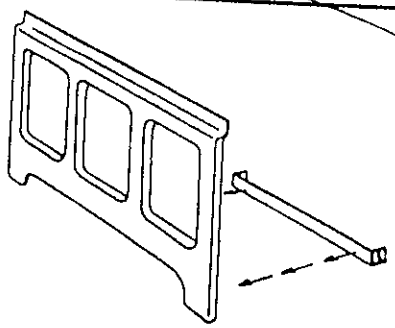
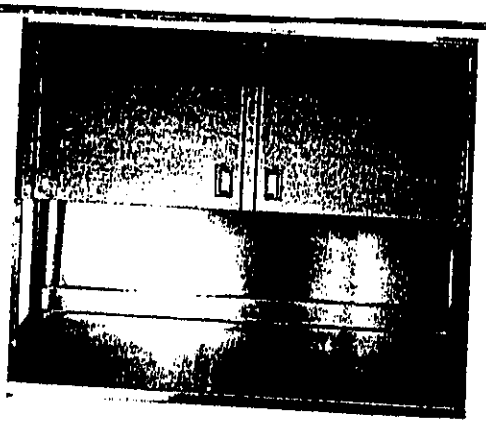
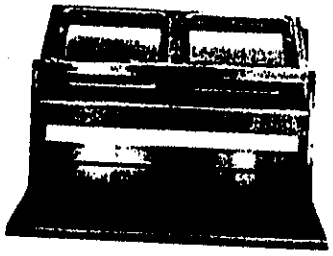
☐ **No. 8723 Divider Tray.** 17½" x 19 11/16" aluminum tray to hold milk cartons, shakes, dixie cups and other products in a refrigerated unit.



☐ ~~**No's. 8733, 8734, 8735,**~~ **8736 Close-Off Back Panel.** Material to be of flame retardant ABS formed plastic. Removable close-off side panel to be recessed too accept decorator panels.

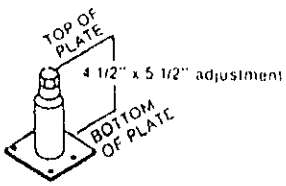


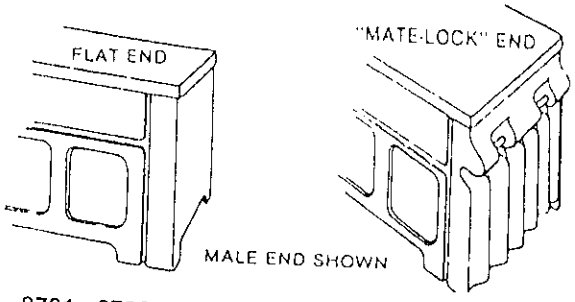
☐ **No's. 8960, 8961, 8962, 8963 Wall Hutch.** Material to be #4 polish stainless steel with stainless steel doors, recessed latches, locks & keys, stainless steel wall guard, and stainless steel shelves.



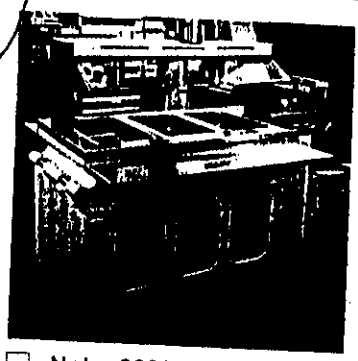
☐ **No's. 8624, 8625, 8626, 8627 Recessed & Angled Display Shelves.** Material to be #4 polish stainless steel with slanted shelves with cut outs for food service pans. May be mounted back to back for double service.

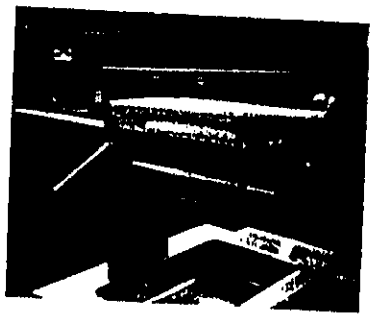
☐ **No. 8783 Bullet Feet (Set of 4).** Plated metal legs with 1" adjustment. Used in lieu of casters.



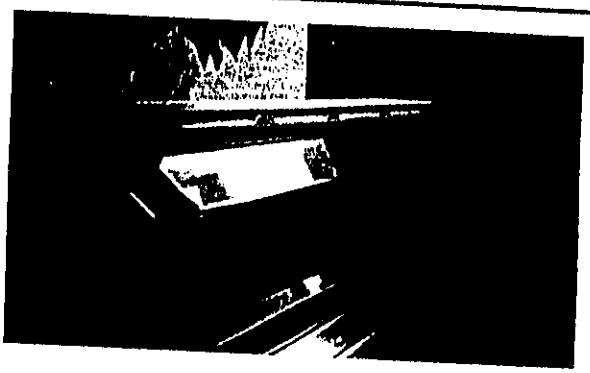




☐ **No's. 8731, 8732 Flat End Panel (Replaces Male/Female "Matelock").** Neutral colors, dove white, pewter tan or black pearl. Made of flame retardant ABS formed plastic material. Panel allows for squaring end of module to wall where necessary. 8731 fits female. 8732 fits male.

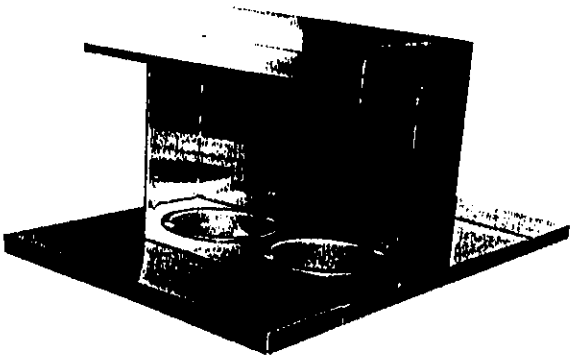




☐ **No's. 8639, 8640, 8641 Safety Glass** framed in stainless steel in lieu of Plastic for heat lamp canopy and **No. 8978 Lift Up Option.**



☐ **No's. 8895, 8897, 8898, 8899 Safety Glass** framed in stainless steel in lieu of Plastic for lighted buffet canopies.



☐ **No's. 8719, 8943 Soup Cup Shelf.** Stainless steel with side walls & rear wall cup retainers. Shown with optional plate rests and soup wells.



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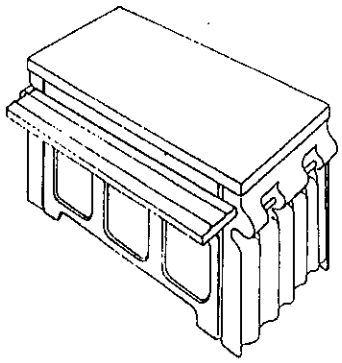
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

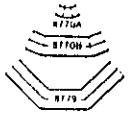
NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

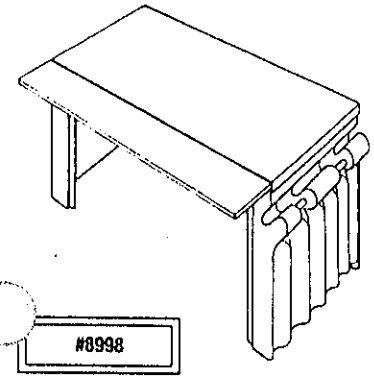


Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28" - Short 20 7/8" | | Full 50" - Short 42 7/8" | | Full 64.5" - Short 57 3/8" | | Full 79" - Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| New! 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |



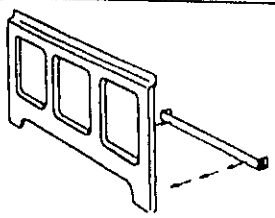
Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029



#8998

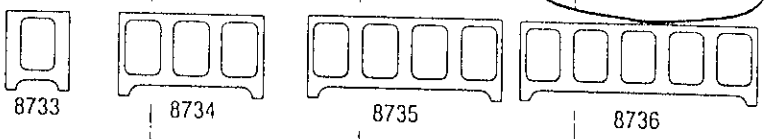
Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28" - Short 20 7/8" | | Full 50" - Short 45 7/8" | | Full 64.5" - Short 60 3/8" | | Full 79" - Short 74 7/8" | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843. | | | | | | | | |
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

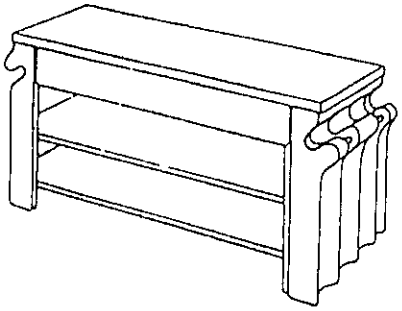


Closure and Access Panel (8734 Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. Note: #9230, #9231, & #9630 cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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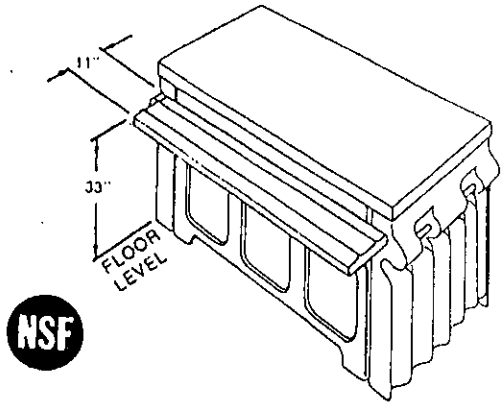
# Galley® Line

## Sanitary, Heavy Duty

## Accessories

Item No. _____

Select from any of these accessories, all especially developed for the **Galley® Line**. Whether it be buffet, cafeteria, speedline, salad bar, or soup and salad, tailor your system to your own needs. Check accessories desired, but refer to basic module specification page for accessory number and dimensions when writing specifications or preparing original purchase order.



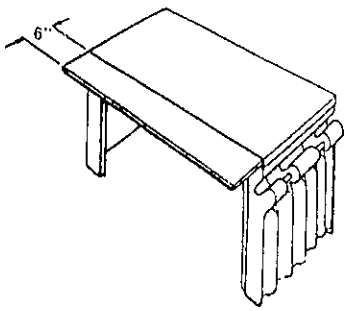

☐ **Folding Trayslide*.** To be full width x 11" wide, mounted 3" above the floor. To be constructed of 18 ga. stainless steel and to feature a three-rib reinforcement for extra strength and durability. "Drop down" stainless steel shelf brackets to be spot welded to underside of trayslide and bolted to side of basic module. When in a folded position, the trayslide is not to extend more than 3½" outward from side of basic unit. Each trayslide specified to include alignment brackets for leveling in serving line-up.

Available on all units except Tray/Silverware Module.

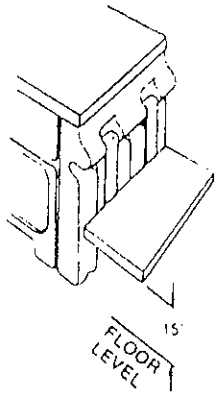
*Trayslides for Corner In-Fill Modules are "lift-off" style.

**Note:** A short trayslide must be used on the first module to the right of the Corner In-Fill Module for inside turns. Specify by width and catalog number.

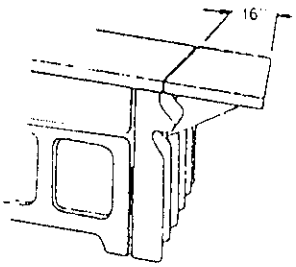
☐ **Cutting Board.** To be full width x 8" wide plastic "self-sealing" sanitary cutting board. To be removable for ease of cleaning plastic surfaces. Mounted with folding supports, permitting shelf to be folded down when not in use. To be mounted so top of surface is flush with Galley Module table top. Available on all modules except Cashier's Stations, Corner In-Fills and Tray/ Silverware Cart. Specify width and catalog number. Adds 3½" to depth of unit when folded down.

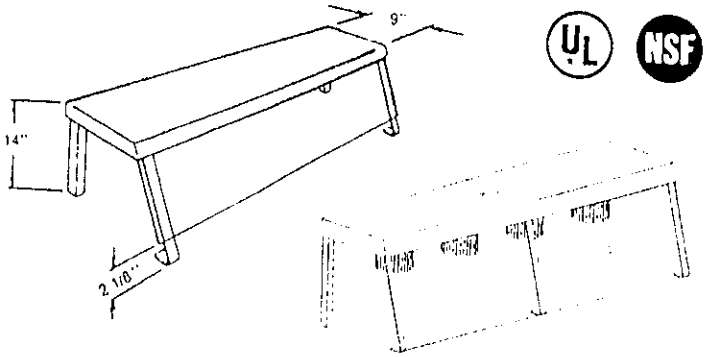



☐ **No. 8725 Low End Shelf.** To be 18 ga. stainless steel, 16"W x 28"D. Adds a place to stack trays at the beginning of a line. Self-mounting...end of module. Shelf is 15" from the floor. Holds 50 trays.




☑ **No. 8754 End Shelf.** To be 18 ga. stainless steel, 16"W x 28"D. Adds 16" additional working width to any Galley Module. Self-mounting feature permits easy installation to either male or female "Matelock" ends of module. Shelf installs flush with module table top.




☐ **Hot Food Protector.** To be full width x 14"H x 9"D. Top shelf to be one of three neutral colors, dove white, pewter tan or black pearl. Made of ABS formed plastic material and supported by two contoured stainless steel uprights. Acrylic "see-thru" breathguard is easily removed for cleaning. Available on all Hot Food, Cold Pan, Refrigerated Cold Pan and Utility Table Modules. Optional with fluorescent lights, heat strips, or heat lamps.

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To F 79" W Model No. | Li |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Shor | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| New! 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Trayslides (8774 Shown)

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent module Shoulder Bolts #2021029

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - | | | | | | | | |
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable** (NSF), Wood 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

#8998

Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |

Closure and Access Panel (8734 Shown)

8733 8734 8735 8736

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves** | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| **Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. Note: #9230, #9231, & #9630 cannot accommodate an undershelf. Undershelves not available for corner modules. | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |

Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)



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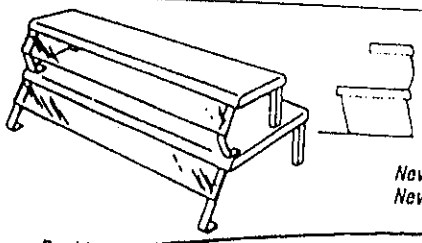
# Galley Line ITEM#63

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Food Protectors

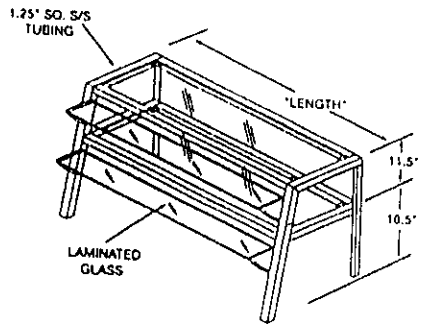
| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Pewter Tan, Dove White or Black Pearl Shelves:** | | | | | | | | |
| Unlighted | 8797 | 92 | 8785 | 97 | 8786 | 103 | 8787 | 108 |
| Lighted | 8819 | 107 | 8788 | 112 | 8789 | 118 | 8790 | 124 |
| **Stainless Steel Shelves:** | | | | | | | | |
| Unlighted | 8646 | 92 | 8647 | 97 | 8648 | 103 | 8649 | 108 |
| Lighted | 8749 | 107 | 8795 | 112 | 8798 | 118 | 8799 | 124 |
| Safety Glass | 8628 | 50 | 8629 | 75 | 8630 | 106 | 8631 | 125 |
| **Replacement items:** Breath Guard | 7002321 - 2 Required | | 7001172 - 2 Required | | 7001173 - 4 Required | | 7001173 - 4 Required | |



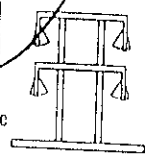
New!
New!

**Double Deck Display, Solid Shelves**

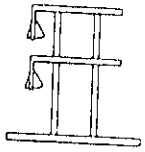
| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Double Deck Glass Shelves and Adjustable Glass Breath Protector** | | | | | | | | |
| Single Service, Unlighted | 8616 | 192 | 8617 | 197 | 8618 | 203 | 8619 | 208 |
| Double Service, Unlighted | 8632 | 210 | 8633 | 212 | 8634 | 218 | 8684 | 224 |
| Single Service, Lighted | 8970 | 202 | 8971 | 217 | 8972 | 223 | 8973 | 228 |
| Double Service, Lighted | 8974 | 220 | 8975 | 232 | 8976 | 238 | 8977 | 244 |
| Single Deck, Glass Shelf and Adjustable Glass Breath Protector Unlighted | 8517 | 100 | 8518 | 115 | 8519 | 130 | 8520 | 145 |



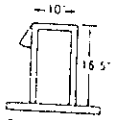

**Double Deck Glass Display (Single Service Shown)**



Double Service

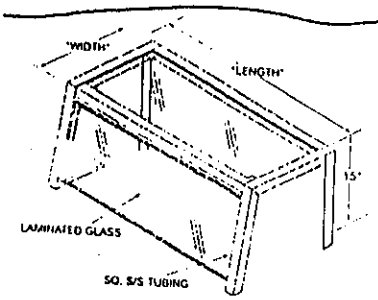


Single Service



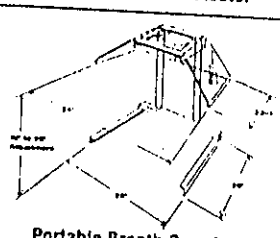

Single Deck

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Single Deck Glass Top Food Protector Unlighted** | 8904 | 140 | 8905 | 150 | 8906 | 162 | 8907 | 174 |
| **Single Deck Stainless Steel Top Food Protector** | | | | | | | | |
| Unlighted | 8932 | 120 | 8933 | 130 | 8934 | 142 | 8935 | 154 |
| Lighted | 8936 | 135 | 8937 | 145 | 8938 | 157 | 8939 | 169 |
| **Verticle Glass Protectors** Up to 28" High in Stainless Frame For Corners | 8913 | 100 | 8914 | 110 | 8915 | 120 | 8916 | 130 |
| | 8917 | 125 | | | | | | |



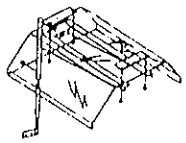

**Single Deck Glass Protector**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Portable Breath Guard Unlighted;** For use on 9011, 9012, 9310, etc. | 8724 | 70 | 8724 | 70 | 8724 | 70 | 8724 | 70 |
| **Corner Breath Guard** Fixed, Unlighted; | 8720 | 70 | | | | | | |
| **Replacement items:** Breath Guard Knurled Knobs | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | | 7001771 2502033 - 4 Required | |

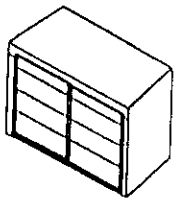


New!

**Portable Breath Guard**
Vertical adjustment to 20"

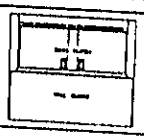


| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Pass Thru / See Thru Refrigerated Display Merchandisers** Sliding Glass Doors on both sides. Prices include complete installation in Galley Module. Compressor Mounted in Module Base. | Not Available Refrigerated Base with Compressor | | 8908 550 Not Available 1/2 HP 12 Amps 115 / 60 / 1 | | 8909 675 8982 250 3/4 HP 16 Amps 115 / 60 / 1 | | 8910 825 8983 275 3/4 HP 16 Amps 115 / 60 / 1 | |



**...erated Display Merchandiser Pass Thru / See Thru**

| Description | Model | Lbs. | Model | Lbs. | Model | Lbs. | Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Over Counter Wall Hutch with Doors, Shelves & Wall Guard All S/S** | 8960 | 250 | 8961 | 350 | 8962 | 400 | 8963 | 450 |





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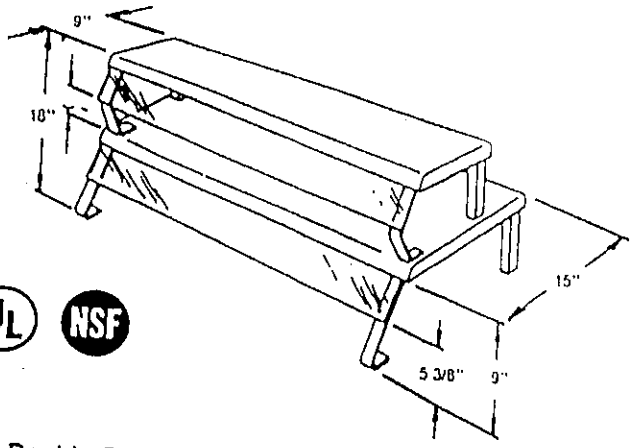
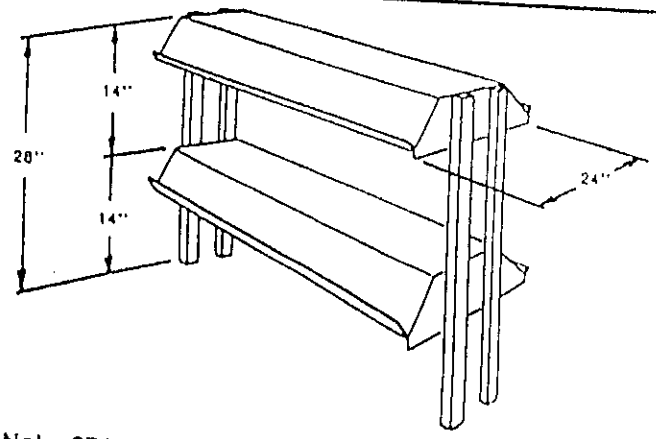
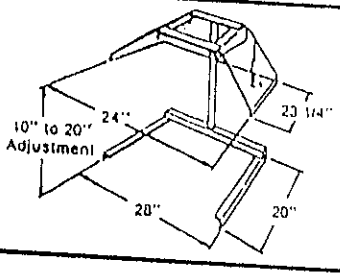


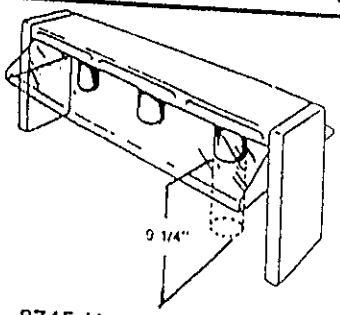

☐ **Double-Deck Display Stand.** To be full width x 18"H x 15"D (overall). To be one of two neutral colors, dove white or pewter tan. Shelving to be of ABS plastic material and supported by two contoured stainless steel uprights. Bottom shelf to be 15"D. Top shelf to be 9" D. Top and bottom acrylic "see-thru" plastic breathguards are easily removable for cleaning. Available on all Cold Pan, Refrigerated Cold Pan and Utility Table Modules.




☐ **No's. 8713, 8714, 8722 Merchandising Shelf.** Stainless steel construction. Designed to be used with baskets or pans.

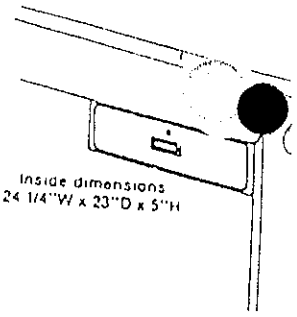
☐ **No. 8724 Portable Breathguard.** Portable free-standing acrylic breathguard. Is adjustable and has a stainless steel frame. Fits on 28" Module.

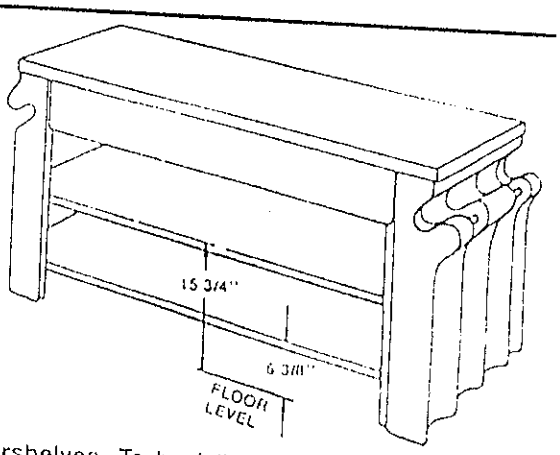



☐ **No's. 8743, 8744, 8745 Heat Lamps Canopy.** Available for 50", 64 ½" and 79" modules in lieu of the standard fluorescent lamp canopy. Each canopy lamp is independently controlled and uses 125 watt bulbs. Canopy size: 24" x 28" x full width.

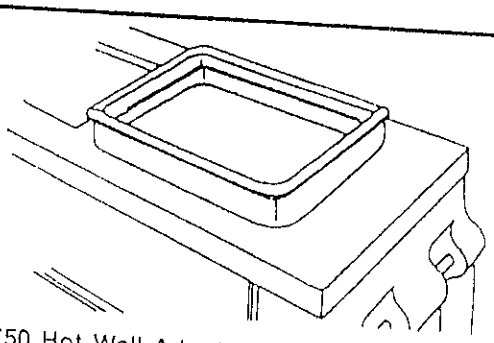
☐ **No. 8760 Utility Drawer.** To be all stainless steel construction and to include lock and removable plastic liner. Outside dimensions are 24 ¼"W x 23"D x 5¼"H. Inside dimensions are 24 ½"W x 23"D x 5"H. Factory installed. Available on Hot Food, Cold Pan, and Utility Table Modules (except Model 9310).



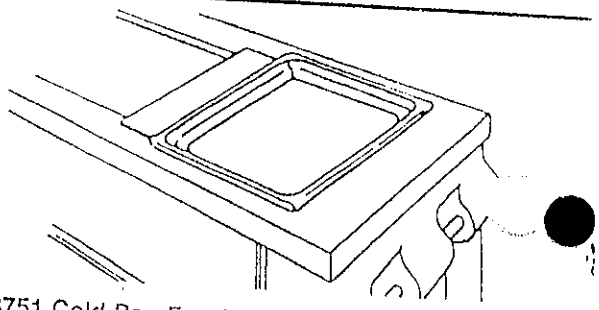




☐ **Undershelves.** To be full width of module interior x 1 deep with 1" turned-down front edge. To be all stainless st and easy to remove. Maximum: two shelves p mod Lower shelf to be 6 ⅜" from floor and upper shelf 15 from the floor. Available on Hot Food, Cold Pan, Cold Pan, and Utility Table Modules. Specify by width, catal number and specify quantity.

Two sets of shelf brackets are installed in case shelves are ordered later.



☐ **No. 8750 Hot Well Adapter.** (For using 6" deep pans in top cutouts of hot food table modules). To be 20 ga. stainless steel. Approximate dimensions: 12 ½" x 20 ½" x 2". A ½" lip projects into food well to keep collar in place.



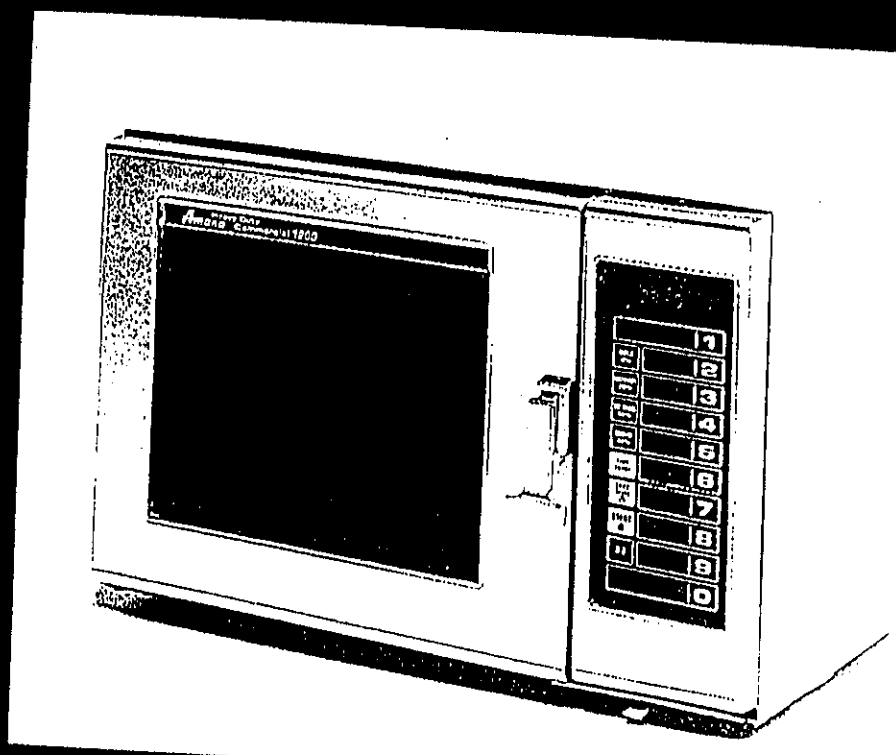
☐ **No. 8751 Cold Pan Food Pan Adapter Bar.** For use with 12" x 20" pans in both cold or refrigerated cold pan modules for covering top opening.

#63a

Radarange COMMERCIAL MICROWAVE

# RFS12MPS

## 1200 WATTS



## High Volume, Full-Featured

- Largest capacity in its class
- Five power levels and X2 double quantity feature
- Easy-to-clean, easy-to-own
- Full 3-year warranty

SO•9001

ORLD CLASS
UALITY

HIGH PERFORMANCE HAS A PRICE

Amana Radarange
COMMERCIAL MICROWAVE OVENS

# RFS12MPS
## 1200 WATTS

# An Amana Classic: Heavy Duty Stainless Steel, Full Sized, Full-Featured.

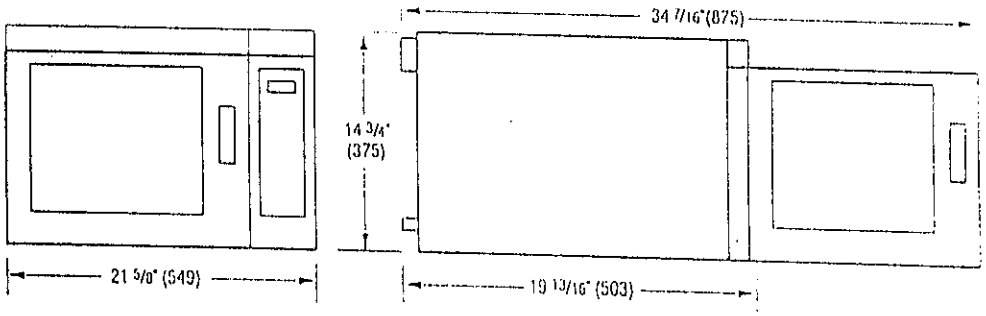
- **Versatile Value**
  Amana's RFS series of ovens feature the largest capacity in their class. A large 1.2 cubic foot interior and a superior cooking pattern allow you to prepare a greater variety of menu items.
- **Durable and Dependable**
  This series is designed for use in most medium to high volume foodservice locations. A stainless steel interior and exterior and a heavy duty interlock switch are only two reasons the RFS series has a strong and loyal following.
- **Unbeatable Security**
  A full 3-year warranty on parts, labor and travel provides maximum protection and is backed by over 700 fully trained and factory authorized service contractors across North America.
- **Easy-to-Clean**
  Our exclusive sealed-in shelf is only one example why Amana Commercial products are easy-to-maintain, easy-to-use and easy-to-own.
- **Double the Simplicity**
  A X2 quantity pad simplifies operation and training and improves product quality consistency when preparing more than one order at a time.
- **Easy-to-Train, Flexible Menu**
  Programmable selection of up to 100 menu items ensures fast, consistent operation. Pads can be preset by power level and time for fast, consistent operation. 5 power levels, from full power to hold, provide flexibility for heating a wide variety of food items from frozen to fresh.

Toll Free
1-800-843-8304
In Canada, call
905-567-5200

**Model RFS12MPS — Heavy Duty Stainless Steel Microwave Oven**

| Cabinet | Exterior Dimensions in (mm) | Usable Interior Dimensions in (mm) |
|---|---|---|
| Height | 14 3/4" (375) | 9 1/2" (241) |
| Width | 21 5/8" (549) | 13 1/2" (343) |
| Depth (overall) | 19 13/16" (503) | 15 11/16" (398) |
| Depth (door open 90°) | 34 7/16" (875) | |
| Usable Cavity Space (liters) | | 1.2 cu. ft. (34) |
| **Electrical Characteristics** | | |
| Output Power (watts nominal)* | 1200 | |
| Power Required | 120V, 60 Hz, 20A | |
| Watt Input | 2,000 watts | |
| Frequency | 2,450 MHz | |
| Power Cord (m) | 5' (1.5) | |
| Plug Configuration | 5-20 | |
| **Weight** | | |
| Approximate Shipping (kg) | 68 lbs. (31) | |
| **Warranty** | | |
| 3 years, full. | | |

Amana's continuing commitment to quality products may mean a change in specifications without notice.
* Microwave output power ratings based on IEC 705 test.




TO SPECIFY AN AMANA RFS12MPS COMMERCIAL RADARANGE MICROWAVE OVEN:
Oven shall be certified to have been designed and tested for compliance to the applicable U.S. Government Department of Health and Human Services performance standards for microwave ovens. Electrical controls for the oven shall consist of a touch control panel featuring single and multiple program pre-set timing methods, variable entry timing, five power levels and nine programming options. Programming shall be all electronic and shall not require tools. There will be no need to pull out the inner panel, match wires and post or adjust screws. There shall be 10 numbered pads, a digital readout display and START, STOP/q 02RESET, TIME ENTRY, DEFROST, HOLD, MED-HI, MEDIUM power and X2 pads. The oven shall have "instant-on" operation to provide microwave energy for the entire time selected. A "Permanent" memory shall lock in programming instructions even if power is disconnected for years. No batteries shall be used. There shall be built-in thermal protection. Oven interior shall be of top feed design with an enclosed rotating microwave antenna that distributes microwaves evenly. The side-swing door will have a see through window and shall be intrusion-proof with a slotted choke seal plus 3 interlock safety switches. Oven shall meet the standards and carry labels of NSF, U.L. and CSA. Oven shall have a five-foot power cord with 3-prong plug. Oven shall have a full three-year warranty.

Form No. ACRR9570
Printed in the U.S.A.

Amana
HIGH PERFORMANCE HAS A NAME™

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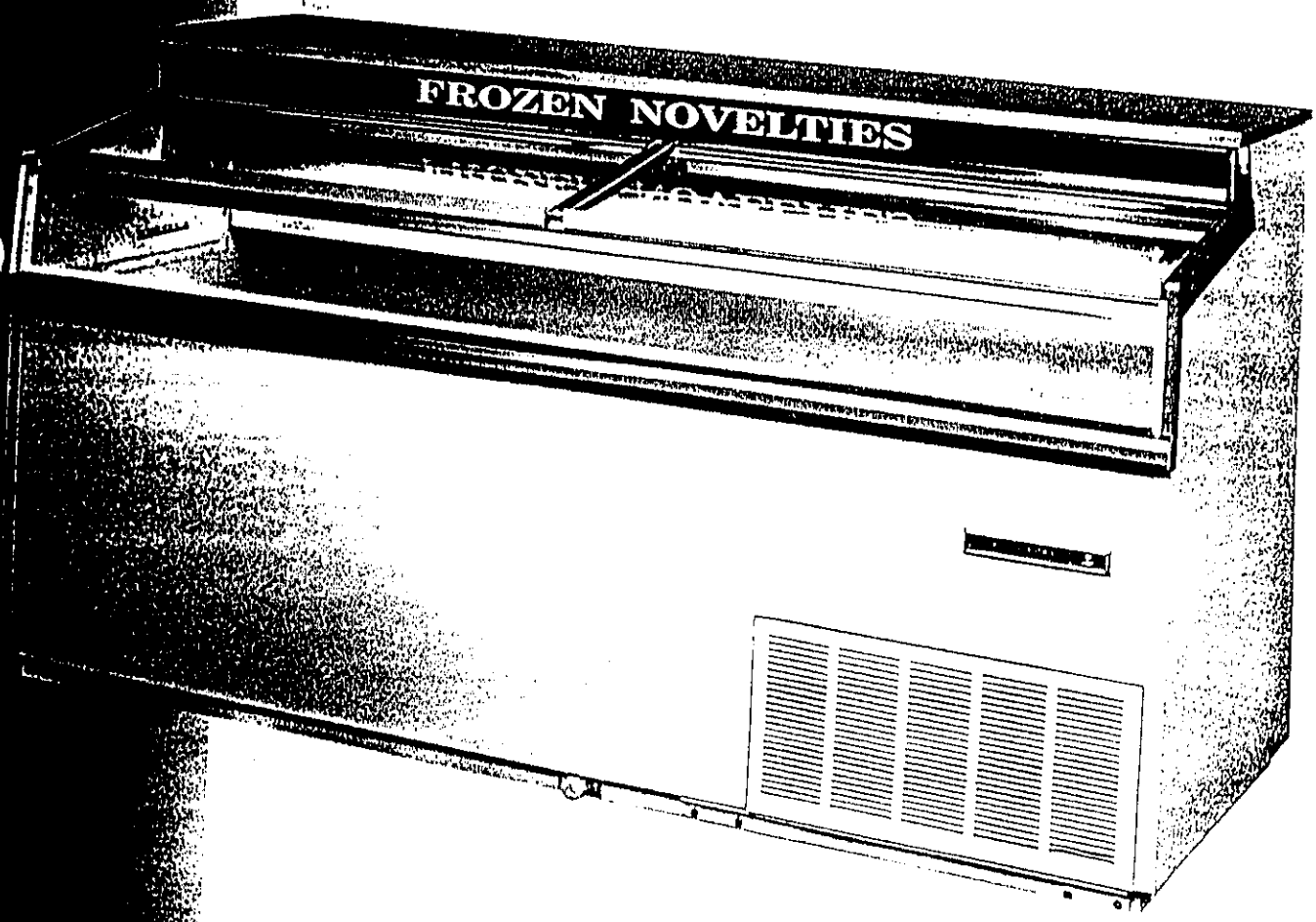
Kelvinator

#64

# Glass Front, Low Temperature Countertop Merchandisers

Wheels




Carrier

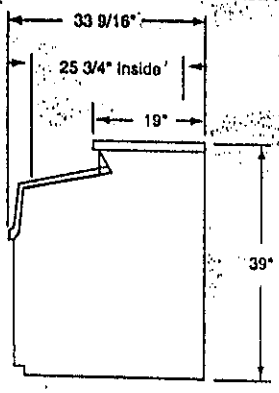
# LOW TEMPERATURE COUNTERTOP MERCHANDISE

| | CMCT 4 | CMCT 5* | CMCT 6 |
|---|---|---|---|
| **Temperature Range** | 0° to -20°F | 0° to -20°F | 0° to -20°F |
| **Insulation** | 2-1/2" Urethane Foam in Place | 2-1/2" Urethane Foam in Place | 2-1/2" Urethane Foam in Place |
| **Number of Lids** | 2 | 2 | 2 |
| **Lid Construction** | 3/16" Glass Radiant Heated | 3/16" Glass Radiant Heated | 3/16" Glass Radiant Heated |
| **Capacity** | 11 cu. ft. | 15 cu. ft. | 19 cu. ft. |
| **Capacity (1/2 gallons)** | 120 | 170 | 225 |
| **Novelty Baskets Load Level** | 8 | 10 | 12 |
| **Capacity Novelty Baskets Total** | 16 | 20 | 24 |
| **Shipping Weight (Approx.)** | 486 | 558 | 624 |
| **Compressor Size** | 1/2 HP | 1/2 HP | 1/2HP |
| **Condenser Type** | Bare Tube Forced Air | Bare Tube Forced Air | Bare Tube Forced Air |
| **Evaporator Type** | Fin & Tube Gravity Coil & Cold Wall | Fin & Tube Gravity Coil & Cold Wall | Fin & Tube Gravity Coil & Cold Wall |
| **Refrigerant** | R-404A | R-404A | R-404A |
| **Refrigerant Control** | Capillary | Capillary | Capillary |
| **Defrost System** | Electric | Electric | Electric |
| **Rated Amps** | 11.0 | 11.0 | 12.0 |
| **Electrical Specs.** | 115/60/1 | 115/60/1 | 115/60/1 |
| **Power Cord** | 15 Amp Cord with 5-15 NEMA Plug | 15 Amp Cord with 5-15 NEMA Plug | 15 Amp Cord with 5-15 NEMA Plug |
| **NSF-7 (Ice Cream Merchandiser)** | Yes | Yes | Yes |
| **UL & CUL Listed** | Yes | Yes | Yes |
| **Counter Construction** | Laminated Wood/19" Width | Laminated Wood/19" Width | Laminated Wood/19" Width |
| **Interior Finish** | High Quality Powder Coat Finish on Galvanized Steel | | |
| **Exterior Finish** | High Quality Powder Coat Finish | | |
| **Lighted Sign** | Standard | Standard | Standard |

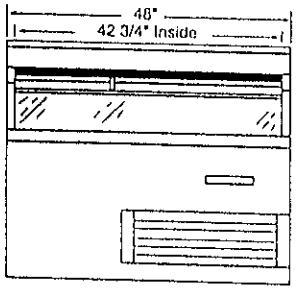
**Production Runs of 15 or More*

***Due to our policy of continuous product improvement, specifications are subject to change without notice.***

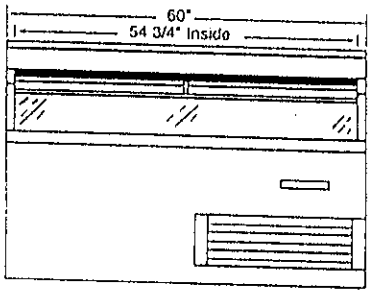
LOW TEMPERATURE COUNTERTOP MERCHANDISE



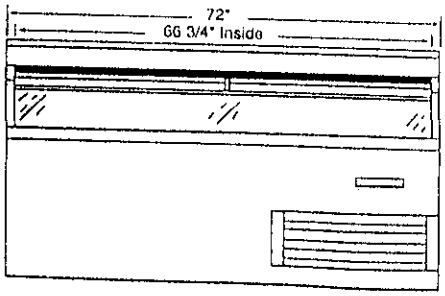

**SIDE VIEW**




**CMCT 4**




**CMCT 5**




**CMCT 6**

SET-N-SERVE®
A SHOWCASE OF LEADERSHIP

# CART LINE I

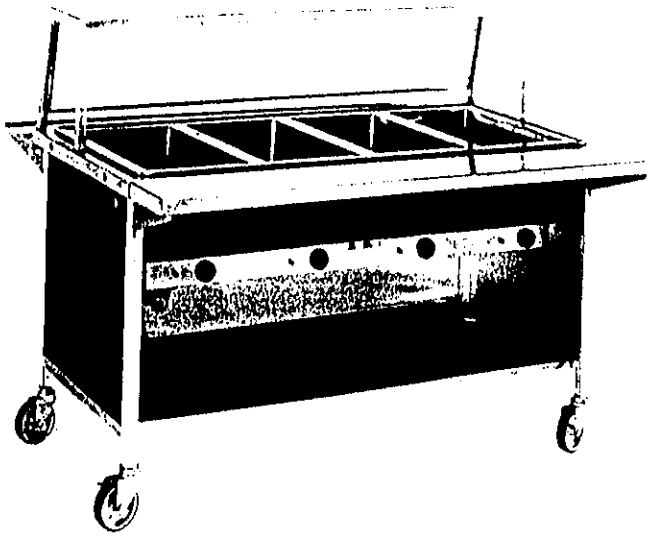
## HOT FOOD CART

### Electrically Heated
### Individual Controls

Item No. #66

Quantity _____

- CWIH-2
- CWIH-3
- CWIH-4
- CWIH-5
- ✓ CWIH-6



CWIH-4
Shown with accessories

### DESCRIPTION:

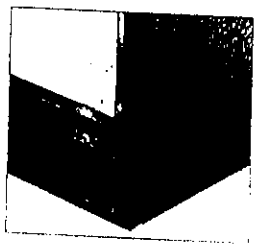
The Cart Line I Hot Food Cart is an attractive, functional unit designed to keep hot foods hot - at their peak of serving perfection. The modular cart base, with its drop-in heated pan, will accommodate standard steam table pans in individual 12" x 20" hot food wells that can be used wet or dry. Each well is provided with an individual thermostat control.

The attractive streamlined design, plus the variety of laminates give you a wide range of choices to complement any decor. The unmatched feature of Cart Line I is the self-locking device which eliminates loose fasteners or molding strips to lock units together. Simply push the units together; the carts will automatically lock and the top will be flush and level, regardless of the floor's condition. It's the right cart for your serving line needs.

### FEATURES:

- Fully insulated to retain heat - individual, thermostatically controlled 12" x 20" hot food wells
- Positive self-locking device - keeps tops level and equipment in place
- Fully mobile - each unit is provided with 5" dia. swivel casters, two with brakes
- Versatile - available in a wide range of sizes and a wide variety of finishes and colors
- NSF certified; UL and CSA recognized

☐ DESIGNER SERIES: The popular Designer Series option provides attractive laminate finishes with stainless steel trim. A full line of designer accessories is available including recessed casters with skirting and laminate tray slides with runners.



Available as an accessory

Atlas Metal
INDUSTRIES, INC.

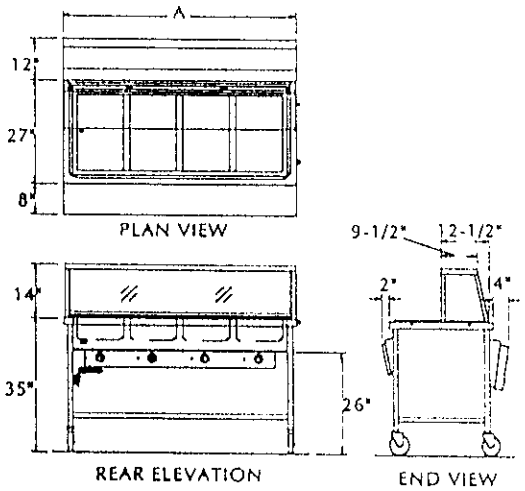
*a subsidiary of Mercury Aircraft*
1135 NW. 159 Dr., Miami, Florida 33169
Tel: (305) 625-2451 or (800) 762-7565 • Fax: (305) 623-0475

# HOT FOOD CART

## Electrically Heated Individual Controls

| MODEL | "A" | FOOD WELLS | ELECTRICAL* CHARACTERISTICS | NEMA CONFIGURATION | SHIP WT. (lbs.) |
|---|---|---|---|---|---|
| CWIH-2 | 32-3/4 | 2 | 1.7 KW - 8.2 amps. 208 V | 6-15P | 145 |
| CWIH-3 | 46-1/2 | 3 | 2.55 KW - 12.3 amps. 208 V | L6-20P | 180 |
| CWIH-4 | 60-1/4 | 4 | 3.4 KW - 16.3 amps. 208 V | L6-30P | 230 |
| CWIH-5 | 74 | 5 | 4.25 KW - 20.4 amps. 208 V | L6-30P | 285 |
| CWIH-6 | 87-3/4 | 6 | 5.1 KW - 24.5 amps. 208 V | L6-50P | 335 |

*NOTE: 1000 watt heating elements are available. All 208 volt units are available in 240 volts; CWIH-2 & CWIH-3 are also available in 120 volts - contact factory for electrical specifications.




## SPECIFICATIONS:

**TOP:** Constructed of 16 gauge, type 304 stainless steel, die-formed, welded, ground and polished. Top is provided with an opening to receive the appropriate sized drop-in hot serving unit. An integral locking device shall be provided to align and retain cart positioning when two or more carts are joined.

**BODY:** Frame construction shall be of hi-tensile stainless steel square tubing, 1-1/4" x 1-1/4". Frame sections are all welded construction, ground and polished to a uniform finish. Body is complete with front panel of plastic laminate on .050 aluminum. Owner to specify finish.

**HOT SERVING UNIT:** The cart is complete and includes a WIH series drop-in hot serving unit installed in the top. Constructed of 18 gauge, type 304 stainless steel with raised perimeter bead and solid vinyl gasket. Individual 12" x 20" hot food wells are provided, fabricated of 18 gauge stainless steel, one piece construction, all welded, ground and polished to a uniform finish. All corners are coved with a minimum 1/4" radius. Each well is provided with an 850 watt heating element.

**CASTERS:** The casters shall be 5" diameter, non-marking rubber tired, swivel type with ball bearings in both swivel and axle raceways, and provided with grease fittings. Both casters on operator's side have toe activated brakes.

**ELECTRICAL:** The unit is provided with a pre-wired single thermostat control for each well, with a pilot light. A 6' long, 3-wire cord and plug is provided, extending from the control box located under the unit, on operator's left. Available for single phase power only.

*Specifications subject to change without notice.*

## ACCESSORIES:

- SL - Tray Slide, 12" wide, stainless steel, 2-rail, fold down
- SLT - Tray Slide, 12" wide, stainless steel, 3-rail, fold down
- SLS - Tray Slide, 12" wide, stainless steel, solid, ribbed, fold down
- SLF - Tray Slide, 12" wide, plastic laminate with S/S runners, fold down
- SH - Work Shelf, 8" wide, stainless steel, fold down
- CB - Work Shelf, 8" wide, hardwood maple, fold down
- CR - Work Shelf, 8" wide, Richlite, fold down
- PRC - Protector Case
- PRCL* - Protector Case with fluorescent lights
- PRHC* - Protector Case with food warmer
- PRHLC* - Protector Case, 18" high, with heat lamps
- PRVC - Protector Case, sneeze guard only
- OSC-X/OSDC-X - Buffet style overshelf, single/ dual service
- OSC/OSDC* - Buffet style overshelf with fluorescent light, single/ dual service
- OSHC/OSDHC* - Buffet style overshelf with heat lamps, single/ dual service
- SG - Plexiglas sneeze guard
- Plexiglas end guards for protector case and buffet canopy
- ✓ S - Stainless steel front panel
- EPA - End panel, plastic laminate/ ✓ stainless steel
- ✓ RP - Removable rear panel
- RPS - Rear sliding doors
- ✓ US - Stainless steel undershelf, removable
- Front skirt with recessed casters
- End skirt
- Rear skirt
- ✓ Individual drain for each well with manifold to single valve. (Additional valves may be specified - CONTACT FACTORY.)
- ✓ Stainless steel adapter plate - specify openings
- Apron mounted remote controls
- 1000 watt heating elements in lieu of 850 watts*

SINGLE SERVICE

DUAL SERVICE

## DESIGNER SERIES:

- Designer Series framed front panel
- Designer Series framed end panel
- Designer Series framed sliding rear panel
- Designer Series front/rear skirt, framed, with recessed casters
- Designer Series end skirt, framed

* Change in electrical required, CONTACT FACTORY


Atlas Metal INDUSTRIES, INC.

*a subsidiary of Mercury Aircraft*
1135 NW. 159 Dr., Miami, Florida 33169
Tel: (305) 625-2451 or (800) 762-7565 * Fax: (305) 623-0475

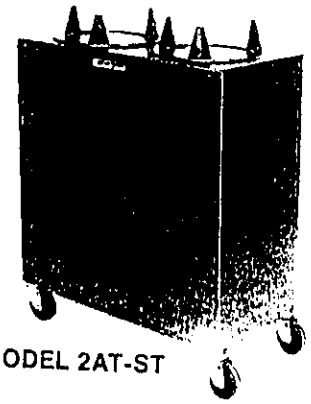
PROJECT QUANTITY ITEM NO #68

DISH

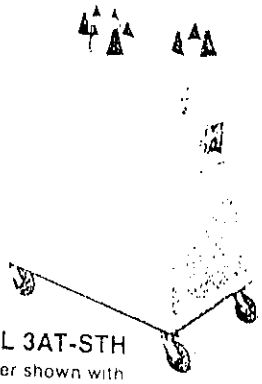
# DISPENSERS

**CABINET STYLE, MOBILE**
**UNHEATED OR HEATED, ADJUSTABLE**

CAPACITY OF EACH TUBULAR DISPENSER—
Approx. 28 to 36 bowls or 50 to 72 plates.



**MODEL 2AT-ST**



**MODEL 3AT-STH**
Dispenser shown with optional wrap-around bumper.

**MODEL 4AT-ST**

## SPECIFICATIONS

Models AT-ST unheated and AT-STH heated, cabinet style, mobile dish dispensers.

**FRAME AND BODY:** The frame is constructed of all welded heavy gauge steel finished with gray baked enamel over rust-resisting undercoat. The body sides are 20 ga. stainless steel and top is 18 ga. stainless steel. Bodies on AT-STH models are insulated on sides and top and lined with zinc coated steel.

**DISPENSERS:** All units are fitted with model AT adjustable drop-in dish dispensers (see catalog page A-1 for specifications). Units are also available for oval platters. (See catalog page A-2, Model ATDO)

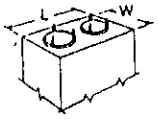
**HEATING SYSTEM:** AT-STH models are fitted with a 120 or 208 volt (as specified) single phase, thermostatically controlled heating system complete with a recessed control panel with on-off switch, neon pilot light and adjustable thermostat. The unit is equipped with a 4" long, three wire cord set with NEMA 5-15P plug for 120V or NEMA 6-15P for 208 volt. The unit is Underwriters Laboratories listed.

**CASTERS:** Unit is mounted on four 4" diameter heavy-duty, double ball bearing swivel casters with non-marking rubber tires.

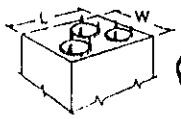
## OPTIONAL ITEMS

- ☐ One piece, wrap-around, non-marking vinyl bumper. (Add 2" to length and width.)
- ☐ 12" vertical bumpers. (Add 1" to length and width.)
- ☐ 5" diameter heavy-duty casters. (Increase height 1".)
- ☐ Casters with polyurethane tires.

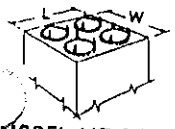
**NOTE:** Please circle model number required.




MODEL 2AT-ST(H)




MODEL 3AT-ST(H)




MODEL 4AT-ST(H)

DIMENSIONS

| DISH DIAM. | UNHEATED MODELS | | | | | | | | | HEATED MODELS | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MODEL NO. | L | W | MODEL NO. | L | W | MODEL NO. | L | W | MODEL NO. | L | W | MODEL NO. | L | W | MODEL NO. | L | W |
| 5⅛ Max. | 2AT1-ST | 23 | 13 | 3AT1-ST | 25 | 16 | 4AT1-ST | 22 | 22 | 2AT1-STH | 25 | 15 | 3AT1-STH | 27 | 18 | 4AT1-STH | 24 | 24 |
| 5¼ to 5⅝ Max. | 2AT2-ST | 23 | 13 | 3AT2-ST | 25 | 16 | 4AT2-ST | 22 | 22 | 2AT2-STH | 25 | 15 | 3AT2-STH | 27 | 18 | 4AT2-STH | 24 | 24 |
| 6 to 6⅝ Max. | 2AT3-ST | 27 | 14 | 3AT3-ST | 28 | 19 | 4AT3-ST | 26 | 26 | 2AT3-STH | 29 | 16 | 3AT3-STH | 32 | 27 | 4AT3-STH | 28 | 28 |
| 6¾ to 7⅜ Max. | 2AT4-ST | 27 | 14 | 3AT4-ST | 28 | 19 | 4AT4-ST | 26 | 26 | 2AT4-STH | 29 | 16 | 3AT4-STH | 32 | 27 | 4AT4-STH | 28 | 28 |
| 7½ to 8¼ Max. | 2AT5-ST | 27 | 14 | 3AT5-ST | 35 | 24 | 4AT5-ST | 31 | 31 | 2AT5-STH | 29 | 16 | 3AT5-STH | 37 | 26 | 4AT5-STH | 33 | 33 |
| 8⅜ to 9¼ Max. | 2AT6-ST | 31 | 16 | 3AT6-ST | 35 | 24 | 4AT6-ST | 31 | 31 | 2AT6-STH | 33 | 18 | 3AT6-STH | 37 | 26 | 4AT6-STH | 33 | 33 |
| 9⅜ to 10¼ Max. | 2AT7-ST | 31 | 16 | 3AT7-ST | 35 | 24 | 4AT7-ST | 31 | 31 | 2AT7-STH | 33 | 18 | 3AT7-STH | 37 | 26 | 4AT7-STH | 33 | 33 |
| 10⅜ to 11¼ Max. | 2AT75-ST | 35 | 18 | 3AT75-ST | 38 | 27 | 4AT75-ST | 35 | 35 | 2AT75-STH | 37 | 20 | 3AT75-STH | 40 | 29 | 4AT75-STH | 37 | 37 |
| 11⅜ to 12 Max. | 2AT8-ST | 35 | 18 | 3AT8-ST | 38 | 27 | 4AT8-ST | 35 | 35 | 2AT8-STH | 37 | 20 | 3AT8-STH | 40 | 29 | 4AT8-STH | 37 | 37 |
| Shipping Wt. | 140 | | | 175 | | | 200 | | | 175 | | | 225 | | | 275 | | |
| Wattage | | | | | | | | | | 750 | | | 1500 | | | 1500 | | |
| Amps at 120V | | | | | | | | | | 6.3 | | | 12.5 | | | 12.5 | | |

HEIGHT—Cabinet 36"
Dish guides 4"
Overall 40"

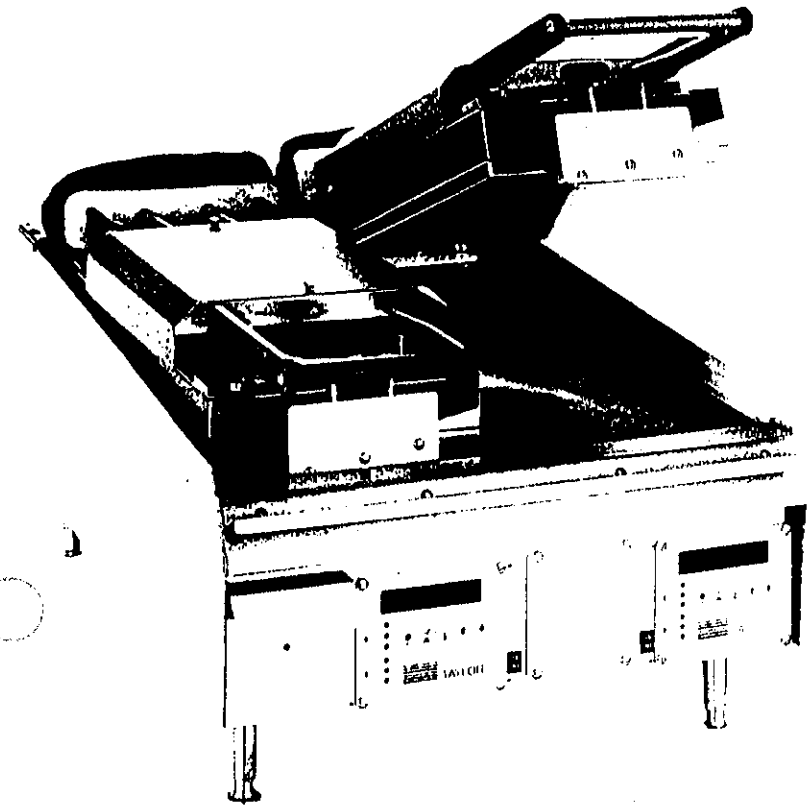
Add 1" to length and width for vertical bumpers
Add 2" to length and width for wrap-around bumpers

SERVOLIFT EASTERN CORPORATION
266 HANCOCK STREET, BOSTON, MASSACHUSETTS 02125
(617) 825-9000 • FAX: (617) 825-1292

69

# Model QS24

Single Platen



The Taylor Model QS24, compact, countertop flat or clamshell grill is designed to deliver fresh, cook-to-order menu items...fast! The two sided cooking method is the reliable solution to increase speed of service, reduce product waste, and assure safe product integrity. And when multiple grills are installed side by side, cooking surface and capacities are greatly increased.

This modular design includes two independent 12" (30.5 cm.) wide cooking zones and one or two 11" (27.9 cm.) optional upper platens. The two-sided, contact cooking concept will cook the top and bottom of the product simultaneously. Product will be cooked-to-order and served to the customer in the least amount of time. And the grill responds quickly, returning to preset temperatures every time fresh or frozen foods are added to the grill surface.

Complete your menu with reliable equipment from Taylor...the new QS24, clamshell grill.

## QS (Quick Self) Quiz

Do you want to serve cooked-to-order products FAST? Yes No

Are quick recovery and reliable cooking temperatures, even during your busiest times important to your business? Yes No

Are you concerned that every grilled product served has achieved the proper internal temperature necessary for product safety? Yes No

**If you answered yes to one or more of these questions, the QS24 offers the solution.**

TAYLOR®

e Taylor world-wide distributor network offers the most complete : of equipment, factory trained service technicians, full parts inventory, merchandising programs, financing, and leasing capabilities to meet your needs. Your local distributor is a Taylor professional who can assist in planning your menu.

# Model QS24

## FEATURES

**Cooking Surface**
Two, 12" (30.5 cm.) wide, 24" (61.0 cm.) deep cook areas, 3 independent heating elements for each 12" (30.5 cm.) of cook surface width. Assures even temperatures and quick recovery.

**Control Board**
Programmable microprocessor controls makes menu selection simple and includes a self-diagnostic feature for serviceability.

**Temperature Controls**
Two individual temperature controls can be set from 150°- 425°F (65.5°- 218.3°C). Left and right side operate independently for menus that require items with varied temperatures.

**Indicator Light**
Lights illuminate when heaters are ON.

## OPTIONS

The modular design can be ordered as a flat grill, one upper platen or two. If one upper platen is required, it can be located on either the left or right hand cook surface.

**Upper Platen (optional)**
Each platen has a cooking surface of 11" x 20" (27.9 cm. x 50.8 cm.). Three individually controlled heaters. Platen can be positioned from 30° to a maximum angle of 60° from cooking surface to accommodate various height locations of existing hood.

**Release Material**
Release material completely covers and protects upper platen cooking surface. Attachment ensures that the release material stays in place throughout the day for easy cleaning and will minimize carbon build-up.

## SPECIFICATIONS

**Clearance**
3" (7.6 cm.) from all combustible materials and 3" (7.6 cm.) of air clearance in rear.

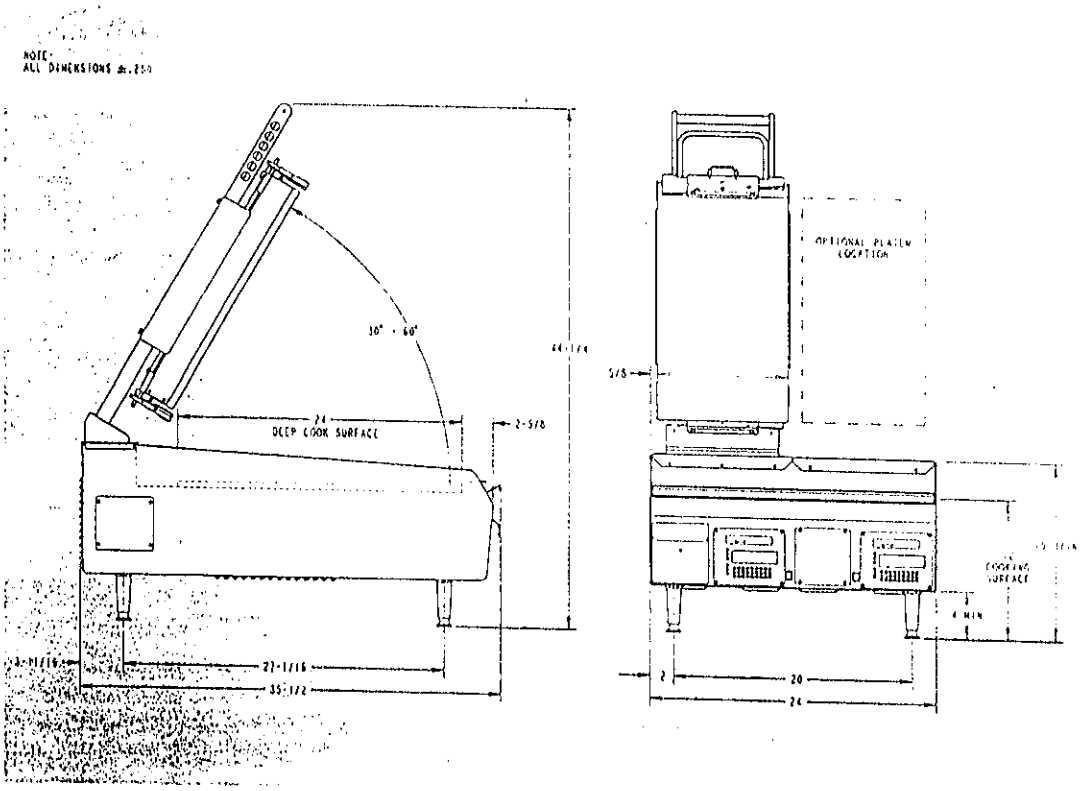
**Dimensions**
Width: 24" (60.9 cm.)
Depth: 35-1/2" (90.2 cm.)
Height: 15-1/4" (38.7 cm.) to top of back splash. 20" (50.8 cm.) with optional upper platen lowered.
Counter Clearance: mounted on 4" (10.2 cm.) adjustable legs.

| Electrical | One dedicated connection. | | |
|---|---|---|---|
| Voltage | Option | Total Amps | KW |
| 208/60/3 | Flat | 23 | 8.4 |
| 208/60/3 | One Platen | 37 | 12.6 |
| 208/60/3 | Two Platens | 46 | 16.8 |
| 240/60/3 | Flat | 20 | 8.4 |
| 240/60/3 | One Platen | 30 | 12.6 |
| 240/60/3 | Two Platens | 40 | 16.8 |

Available in electric only. Other electrical characteristics are available. (For exact electrical information, always refer to the data label of the unit.)

**Weights**
**Flat**
Net: 210 lbs. (95.3 kgs.)
Crated: 275 lbs. (124.7 kgs.)
**One Platen**
Net: 305 lbs. (138.3 kgs.)
Crated: 370 lbs. (167.8 kgs.)
**Two Platens**
Net: 400 lbs. (181.4 kgs.)
Crated: 465 lbs. (210.9 kgs.)
22.0 cu. ft. (0.62 cu. m.)

Availability and specifications subject to change without notice.




Taylor Company
Rockton, Illinois 61072
(815) 624-8333 • (800) 255-0626

Standard 4

E84050

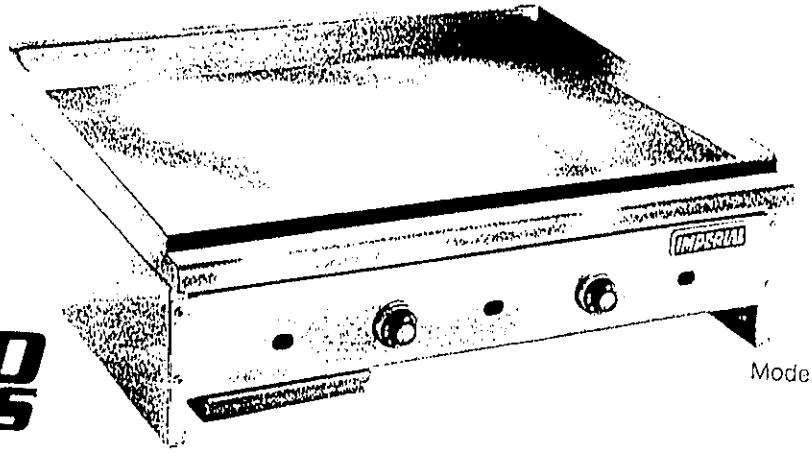
IMPERIAL

Item # #69e

# Heavy Duty Griddles

## and Open Burner Combinations

## Thermostat Controlled



2000 SERIES

Model # ITG-36

### 2000 Series Standard Features

- NEW Aeration baffles between burners spreads heat across griddle for more even heating.
- NEW Full width rear flue aids uniform heat distribution across griddle plate.
- NEW 4" tapered stainless steel splash guard.
- NEW Open burner combinations have 28,000 BTU/hr. lift-off burners and 12" x 12" cast iron top grates.
- NEW Quad Burner options: (1) Anti-Clogging burner with full flame and a 7,000 BTU low simmer (2) All-Purpose (3) Sauté and (4) Wok Jet.
- 30,000 BTU/hr. "U" type burner located every 12" for even cooking on entire griddle surface.
- Thermostat maintains selected griddle temperature during peak cooking periods.
- Energy saving thermostat is adjustable from 150° to 450°F.
- Each burner has a continuous pilot for instant ignition.
- Stainless steel front, ledge and sides.
- Thick 1" highly polished steel griddle plate maintains temperatures and assures quick recovery.
- Full 24" depth plate for more cooking surface.
- Stainless steel grease trough, one piece rolled front.
- Large capacity, removable grease can.
- 24", 36", 48", 60" and 72" width models available.
- One year parts and labor warranty.
- AGA and CGA design certified, NSF and CE Certified.

### The 2000 Series Heavy Duty Griddles

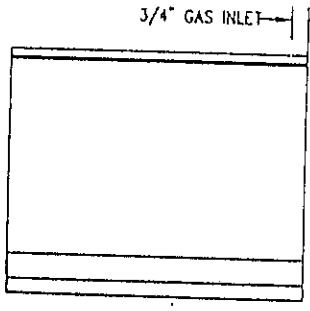
Imperial provides as standard many of the optional upgrades normally offered at a premium on other Griddle lines. The new look features a stainless steel front, ledge and sides. A new 4" high stainless steel tapered splash guard promotes cleanliness.

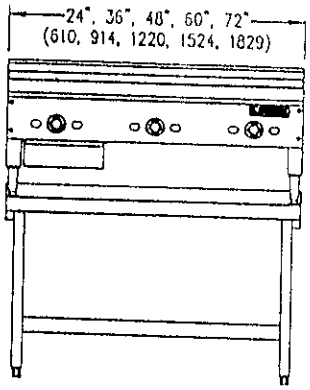
Imperial Heavy Duty Griddles with thermostat controls are designed to maintain your selected temperature during peak cooking periods. The 1" thick highly polished griddle plate is ideal for a wide variety of cooking requirements and the 24" depth provides maximum cooking surface. New features have been added to improve uniform temperatures: aeration baffles are located between burners and a full width rear flue. The 30,000 BTU/hr. "U" type burners are strategically located to provide even heating across the entire griddle surface. The high BTU output, total cooking surface and griddle quality assure the best value on the market.

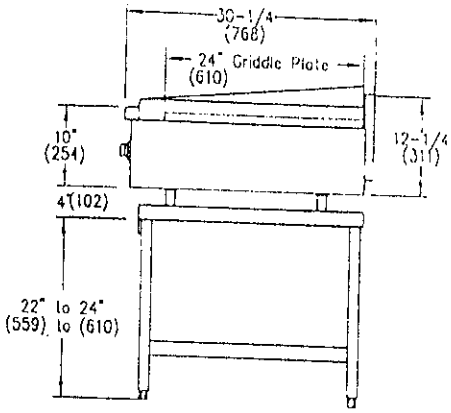
The front stainless steel profile of the griddle is designed to match the IRB Broiler and IHPA Hot Plate series.

NSF CE

# 2000 SERIES Heavy Duty Griddles - Thermostat Controlled




## 2000 Series Heavy Duty Griddles, Thermostat Controlled

| Model# | Griddle Width | Griddle Burners | Overall Width | Total B.T.U. | Ship Weight (Kg) | Ship Weight (Lbs) | Stand Model# | Ship Weight (Kg) | Ship Weight (Lbs) |
|---|---|---|---|---|---|---|---|---|---|
| **Thermostat Controlled Griddles** | | | | | | | | | |
| TG-24 | 24" | 2 | 24" | 60,000 | 136 | 300 | ITGS-24 | 23 | 50 |
| TG-36 | 36" | 3 | 36" | 90,000 | 195 | 430 | ITGS-36 | 32 | 70 |
| TG-48 | 48" | 4 | 48" | 120,000 | 261 | 575 | ITGS-48 | 39 | 85 |
| TG-60 | 60" | 5 | 60" | 150,000 | 328 | 725 | ITGS-60 | 48 | 105 |
| TG-72 | 72" | 6 | 72" | 180,000 | 396 | 875 | ITGS-72 | 62 | 135 |
| **hermostat Controlled Griddles with (2) Open Burner Combinations** | | | | | | | | | |
| G-24-OB-2 | 24" | 2 | 36" | 116,000 | 159 | 350 | ITGS-36 | 32 | 70 |
| G-36-OB-2 | 36" | 3 | 48" | 146,000 | 222 | 490 | ITGS-48 | 39 | 85 |
| G-48-OB-2 | 48" | 4 | 60" | 176,000 | 288 | 635 | ITGS-60 | 48 | 105 |
| G-60-OB-2 | 60" | 5 | 72" | 206,000 | 355 | 785 | ITGS-72 | 62 | 135 |
| G-72-OB-2 | 72" | 6 | 84" | 236,000 | 423 | 935 | ITGS-84 | 77 | 170 |

ote: Add "OB-4" to model number and 12" to overall width for 4 Open Burner/Griddle Combination.
pen burners are located on right side unless specified.
ated Dimensions: Height =14" (356) Depth = 33" (838) Width: add 2½" to Griddle width.

**andard Exterior Finish**

**Stainless Steel:** Front, ledge, grease trough, splashguard and sides.

**Control Knobs:** Durable cast metal, polished chrome.

**iddle Top**

**Thermostat Control:** Energy-saving thermostat is adjustable from 150° to 450° F.

**Griddle Burner:** 30,000 BTU/hr. "U" type located every 12" for even cooking. One standing pilot per burner. Aeration baffles between burners and a full width rear flue provide uniform griddle surface temperatures.

**Griddle Plate:** 1" thick, highly polished plate. No breaking-in required. 24" depth. 4" tapered splash guard.

**Grease Trough:** 3" wide grease trough for easy cleaning.

**Open Burner Top:** 28,000 BTU/hr. cast iron burners with lift-off burner heads. No gaskets, no screws. Four Interchangeable burner heads available: Anti-Clogging is standard, All-Purpose, Sauté and Wok Jet are optional. One standing pilot for each burner for instant ignition.

**Burner Top Grates:** 12" x 12" lift-off sections, heavy duty cast iron. Cast-in bowl directs heat upward. Grate features anti-clogging pilot shield.

### Optional Items

Open burners; one thermostat per burner; and manually controlled gas valves. Open burner options: All Purpose, Sauté or Wok Jet burner head. Extra capacity grease cans; quick disconnect and flexible gas hose; set of 4" legs; stainless steel stands; and casters (front two casters are locking).

### Gas

Manifold pressure is 5.0" W.C. for natural gas or 10.0" for propane gas. Manifold size ¾" NPT. Specify type of gas and elevation if over 2,000 ft.

### Clearance

For use only on non-combustible surfaces. Provide 0" clearance from non-combustible surfaces and 8" from combustible walls at sides and 7" from rear walls.

IMPERIAL
Commercial Cooking Equipment
0 Flower St., Duarte, CA 91010 Phone (626) 357-7411 FAX (626) 359-5909 E-Mail impsls@imperialrange.com Website imperialrange.com



Imperial reserves the right to change materials and specifications without notice
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Project:

Prepared for: Item# 71/132

Date:

# VENTILATOR SYSTEMS

## *ENERGY AIRE* AUTO WASH

## WALL MOUNTED

**Models**
**AWWO**
**AWWP**
**AWWI**
**AWWE**
**AWWD**

AVTEC

### APPLICATION DATA

For use over all types of cooking equipment; unique grease extractor has auto wash and internal fire protection and extracts up to 95% of grease contaminants. Canopies are generally installed 6'-6" above finished floor. Stainless steel enclosure panels to the ceiling are available, or the hood may be recessed into the non-combustible false ceiling, depending on type of air make up - contact factory.

### SUPPLY AIR MAKE-UP

☐TYPE " P" LOW VELOCITY FRONT DISCHARGE SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. Normally air is heated to 55°-65°F. Consult factory for specifics.

The perforated front panel slows the supply air velocity to lessen the effect of partially tempered outside air on conditioned room air. When lowest velocity is desired, the 30" high plenum [ventilator] is recommended.

☐ TYPE "I" INTEGRAL "SHORT CYCLE" SUPPLY

The integral "short cycle" supply air plenum may be used with up to 70% untempered air per U.L. testing. Some local codes limit this percentage or do not allow the "short cycle" concept. Normally, this type hood is used in warmer climates not susceptible to the colder, higher density winter air.

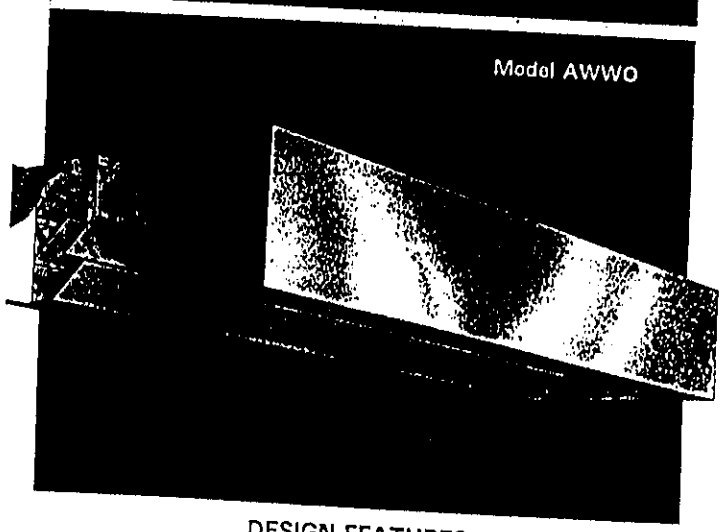
Integral untempered supply make-up air varies according to exhaust requirements, 20% recommended from adjacent areas to contain odors within the kitchen and remaining amount from ceiling registers located ideally 20 ft. from the hood. Consult factory for specifics.

☐TYPE "E" EXTERNAL FRONT GRILL SUPPLY

Same air volumes as "P" type. Recommended for installations where finished ceiling is less than 9 ft. prohibiting effective use of "P" type [above]. The 4-way diffusers and internal balancing dampers allow precise directional control. Generally, air is conditioned to room temperature and directed just below the ceiling.

☐TYPE "D" DUAL EXTERNAL AND INTERNAL SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. A combination of "I" and "E" type, allows for fine tuning of short cycle air supply. Varying climates may require incoming air to be conditioned to room temperature.




### DESIGN FEATURES

- U.L. Listed. Complies with all national codes.
- Auto wash and internal fire protection system.
- Unique extractors remove up to 95% of grease contaminants.
- Integral supply air balancing and fire damper.
- Electromechanical, resettable exhaust fire damper.

### OPTIONS AND ACCESSORIES

- U.L. Listed fusible link exhaust fire damper.
- Stainless Steel enclosure panels to ceiling.
- Auto Wash Control Panel with:
  - √ Fan and/or light switch
  - √ Fire System Interface
  - √ H.O.A. Fan Starter Interface
- Integral fire suppression system enclosure.
- Wet chemical fire suppression system.
- Water mist fire protection system with gas reset.
- Fan motor controller package
- Exhaust & supply fan package

### EXHAUST AIR RECOMMENDATIONS

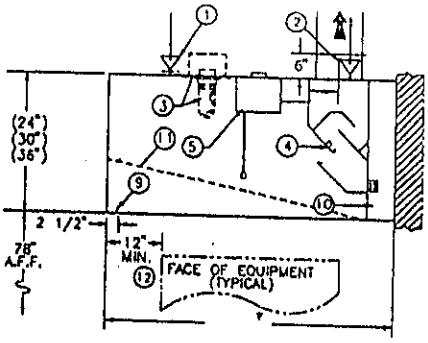
| TYPE EQUIPMENT | MIN. EXHAUST |
|---|---|
| Light Duty<br>Ovens, Steamers, Kettles (25 psig) | 200 cfm/lin. ft. |
| Medium Duty<br>Ranges, Griddles, Fryers, Fry Pans, Kettles (45 psig) | 250 cfm/lin. ft. |
| Heavy Duty<br>Hot Top Ranges, Upright Broilers, Electric Charbroilers | 300 cfm/lin. ft. |
| Extra Heavy Duty<br>Gas and Solid Fuel Charbroilers, Woks (water cooled), Kettles (100 psig) | Consult Factory |

The above figures are to be used as a guideline only. Since local field conditions vary greatly, we strongly suggest you consult the factory or your local AVTEC Representative.

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 (630) 851-4800

VENT. MODEL # AWW_ PROJECT._____ ITEM# _____

## SECTION VIEWS

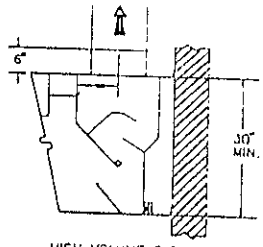



☐ AWWO

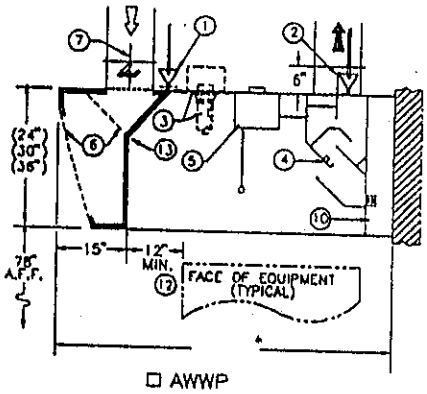
*Recommended width: 51", 57", or 63"

LEGEND

1. Hanger brackets
2. U.L. Listed damper
3. U.L. Listed light fixture (globe) (recessed)(incandescent)(fluorescent)
4. Auto Wash Extractor
5. Damper reset housing
6. Supply air diffuser
7. Balancing damper
8. Fire damper
9. S/S gutter
10. 6" air space
11. 18" Front with tapered End Cap.
12. Recommended minimum overhang. Salamanders and Upright Broilers require 18"
13. Insulation–standard on type I and D

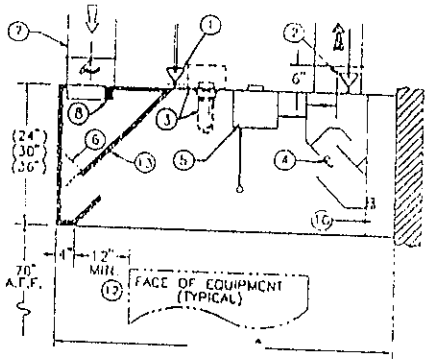



HIGH VOLUME EXTRACTOR ALLOWS LOWER STATIC PRESSURE AT 350 CFM/FT AND HIGHER.



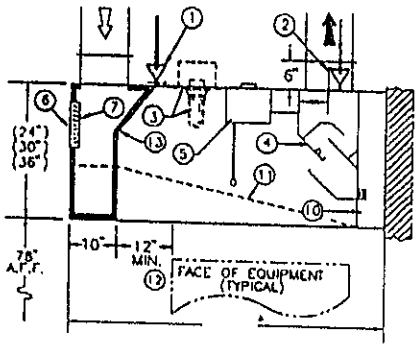

☐ AWWP

*Recommended width: 66", 72", or 78"



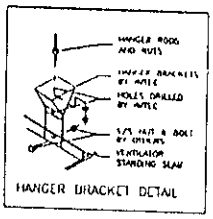

☐ AWWI

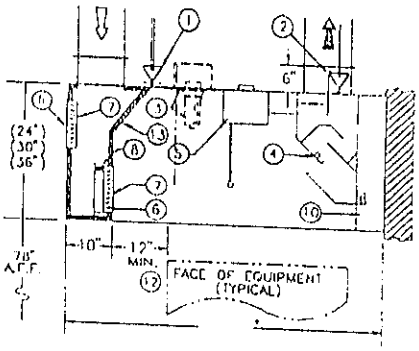
*Recommended width: 55", 61", or 67"




☐ AWWE

*Recommended width: 61", 67", or 73"




☐ AWWD

*Recommended width: 61", 67", or 73"

## AIR FLOW CHART

| VENT LENGTH | 200 CFM/LINEAR FT (Light Duty) | | | | 260 CFM/LINEAR FT (Medium Duty) | | | | 300 CFM/LINEAR FT (Heavy Duty) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EXH. CFM 1.2"SP | EXH. DUCT COL. | SUP. CFM .25"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.3"SP | EXH. DUCT COL. | SUP. CFM .26"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.66"SP | EXH. DUCT COL. | SUP. CFM .25"SP | SUPPLY DUCT COLLAR |
| 3' | 600 | 10"x6" | 480 | 10"x10" | 750 | 10"x8" | 600 | 10"x10" | 900 | 10"x8" | 720 | 10"x10" |
| 4' | 800 | 10"x7" | 640 | 10"x10" | 1000 | 10"x8" | 800 | 10"x16" | 1200 | 10"x10" | 960 | 10"x16" |
| 5' | 1000 | 10"x8" | 800 | 10"x16" | 1250 | 10"x10" | 1000 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" |
| 6' | 1200 | 10"x10" | 960 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" | 1800 | 10"x16" | 1440 | 10"x20" |
| 7' | 1400 | 10"x12" | 1120 | 10"x16" | 1750 | 10"x14" | 1400 | 10"x20" | 2100 | 10"x17" | 1680 | 10"x30" |
| 8' | 1600 | 10"x13" | 1280 | 10"x20" | 2000 | 10"x16" | 1600 | 10"x30" | 2400 | 10"x20" | 1920 | 10"x30" |
| 9' | 1800 | 10"x16" | 1440 | 10"x20" | 2250 | 10"x18" | 1800 | 10"x30" | 2700 | 10"x22" | 2160 | 10"x30" |
| 10' | 2000 | 10"x16" | 1600 | 10"x30" | 2500 | 10"x20" | 2000 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" |
| 11' | 2200 | 10"x18" | 1760 | 10"x30" | 2750 | 10"x22" | 2200 | 10"x30" | 3300 | 10"x27" | 2640 | 10"x40" |
| 12' | 2400 | 10"x20" | 1920 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" | 3600 | 10"x28" | 2880 | 10"x40" |
| 13' | 2600 | 10"x21" | 2080 | 2-10"x16" | 3250 | 10"x26" | 2600 | 2-10"x20" | 3900 | 10"x32" | 3120 | 2-10"x30" |
| 14' | 2800 | 10"x23" | 2240 | 2-10"x16" | 3500 | 10"x28" | 2800 | 2-10"x20" | 4200 | 10"x34" | 3360 | 2-10"x30" |
| 15' | 3000 | 10"x24" | 2400 | 2-10"x16" | 3750 | 10"x30" | 3000 | 2-10"x20" | 4500 | 10"x36" | 3600 | 2-10"x30" |

For cfm, static pressure and duct collar sizes other than above, see Air Flow Requirements form no. 14012. Air speeds vary according to duct collar size; average speeds are 1800 fpm exhaust and 1000 fpm supply

Use above chart for supply air types "P", "E" & "D"; 80% supply air volume shown, 20% from adjacent areas to contain cooking odors within kitchen.

Do not use above chart for untempered short cycle supply type "I"; this should be sized at 40% to 70% of exhaust cfm, 20% from adjacent areas to contain odors, remaining amount from ceiling registers approximately 20 ft. from hood - contact factory.

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AVTEC'S policy of continuous product improvement includes the right to change specifications without notice.

form no. 14008 rev. 393 ©1993 Avtec Industries Inc.

Project:

Prepared for: Item# 71/132

Date:

# AUTO WASH VENTILATOR CONTROL PANEL

Model VCWW

AVTEC

U.S. Patent # 4,156,432

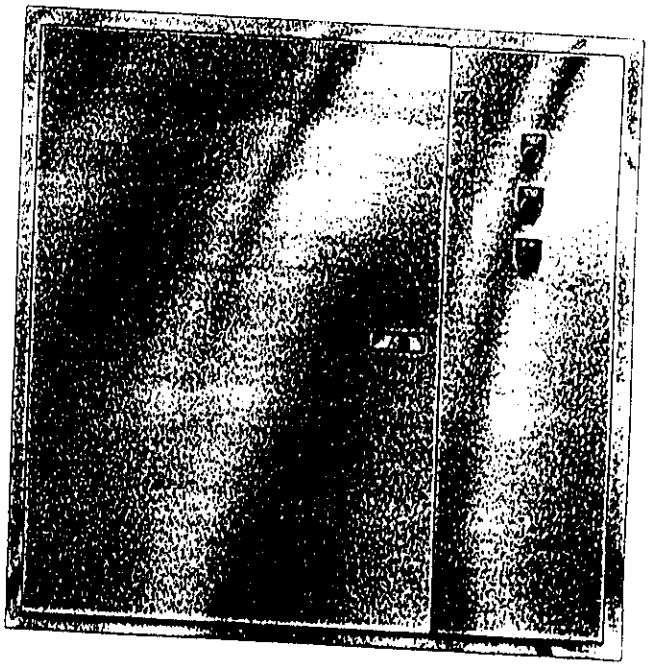
*ECONOMY CONTROL . . WITH AVTEC*

## APPLICATION DATA

The AVTEC Auto Wash Ventilator Control Panel is supplied with the AVTEC Auto Wash Ventilator. The cabinet houses the electrical and plumbing components necessary to control the exhaust [and air make-up] fan(s), auto wash self-cleaning cycle and plenum fire protection system.

One panel will control one or more fans if operated simultaneously. Each panel will operate up to 50 linear feet of ventilator with a single wash [0-10] minutes]; for over 50 feet, use two or more panels. If hot water and low pressure is limited and sequential washes are desired, we recommend the AVTEC "PAWS" Control Panel.

An electric thermal detector fire switch is mounted in the duct collar and automatically activates the plenum fire protection [spray], closes the adjacent fire damper and turns off the fan. An optional flush mounted or remote manual pull fire switch is available to activate the plenum fire protection [spray] and exhaust fan [to remove fumes]. Surface cooking fire protection should be specified with this system. AVTEC'S MIST-A-FIRE System is recommended if a building sprinkler system is available; the control panel for this system may be combined with the AVTEC "PAWS" Control Panel.



## DESIGN FEATURES

UL NSF

- Automatic Wash System shuts OFF fan and injects detergent and hot water into grease extractor chamber for up to ten minutes
- Optional Manual Fire Switch initiates fire quenching spray in plenum and activates fan to remove toxic fumes.
- Automatic Thermal Fire Detector initiates fire quenching spray in plenum, closes the damper to prevent fire from spreading to the ductwork and deactivates the fan.
- Optional Vent Light Switch may be conveniently mounted on control panel.
- Optional Low Level Detergent Alarm

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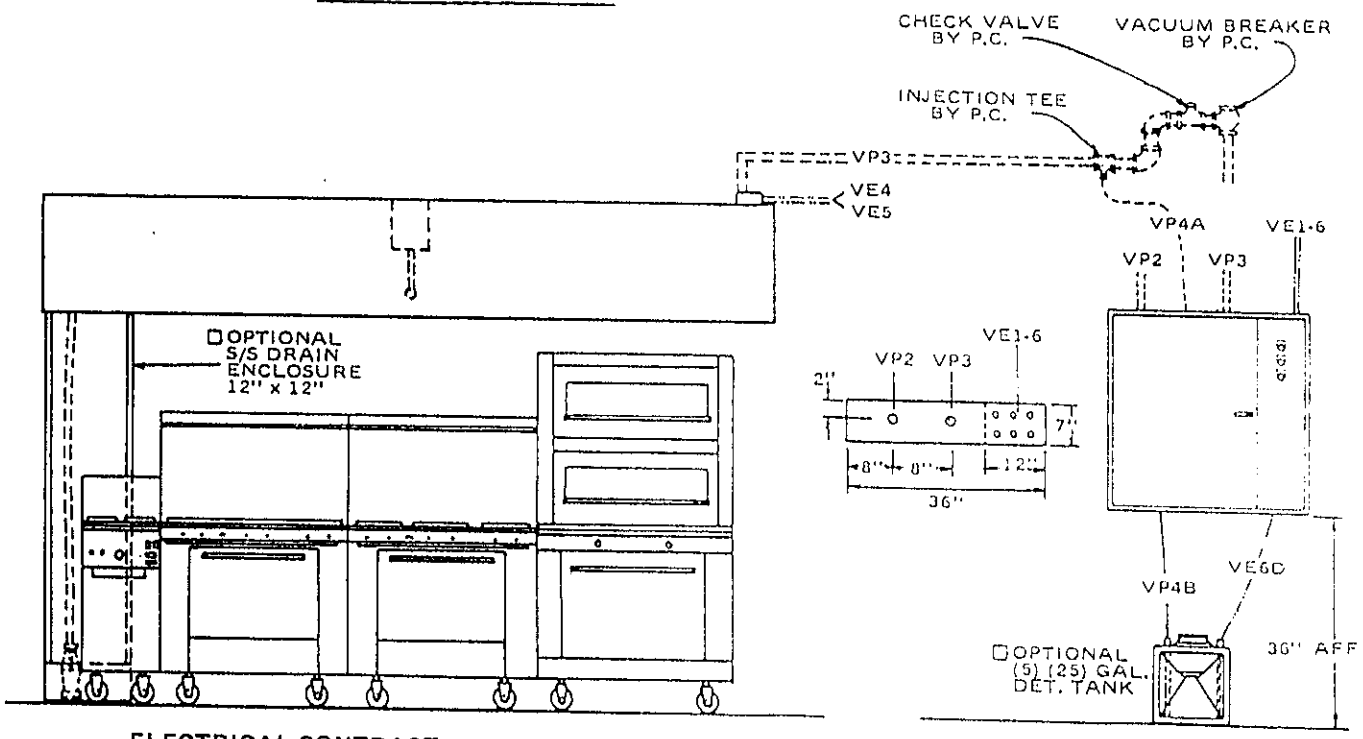
VENT. CONTROL MODEL # VCWW PROJECT:_____ITEM#_____

## SERVICE CONNECTIONS




## ELECTRICAL CONTRACT

### BUILDING SERVICES

VE1 ☐ 20A 120/1 control power supply
VE2 ☐ 20A 120/1 power supply for vent lights.

### FIELD INTERCONNECTIONS

VE3 ☐ 120/1 control circuit to fan magnetic motor controller, for exhaust (& supply) fan(s)
VE4 ☐ 20A 120/1 power from AVTEC panel to vent lights.
VE5 ☐ 120/1 to thermo detector damper box.
VE6 ☐ Provide (2W) field interconnects to (remote only)
- A ☐ Manual Pull Fire Switch
- B ☐ Wash Solenoid Valve 120 volt
- C ☐ Detergent Pump 120 volt
- D ☐ Detergent Sensor Probe 20vdc

CONTROL CABINET SIZE
Standard: 36" x 36" x 7" d
5 Gal. Det. Tank: 36" x 36" x 10" d
Cold Water Mist: 42" x 42" x 7" d
1¼" mounting flange for recessed option.
Add ½" all sides for wall opening.
Weight: 220 lbs. crated

PLUMBING DATA - LENGTH/SIDE

| LENGTH | H.W. INLET |
|---|---|
| 0 - 15' | ¾" |
| 16' - 24' | 1" |
| 25' - 50' | 1¼" |
| over 50' | ** |

** Use multi-wash. Contact factory.

H.W. Flow Rate=1.2 GPM/ft. @25 psi (140°F for 3-5 min.)

## PLUMBING CONTRACT

### BUILDING SERVICES

VP2 ☐ ____" hot water (140°F) to control panel (20 to 40 psi)

### FIELD INTERCONNECTIONS

VP3 ☐ ____" hot water (140°F) to ventilator ____ places.
VP4 ☐ 3/8" Detergent tubing
- A ☐ From detergent pump to injection tee.
- B ☐ Inserted in remote detergent tank.

### OPTIONAL

VP7 ☐ 3/4" cold water to control panel.
VP8 ☐ 3/4" cold water to vent ____ places.

NOTE: Other required connections are shown on Ventilator Rough-In Data Sheet.

**IMPORTANT NOTE: The various trades' installation responsibilities must be included in their contracts.**

## SPECIFICATIONS

Provide AVTEC U.L. Listed, NSF approved, (surface) (recessed) wall mounted Auto Wash Ventilator Control Panel, Model No. VCWW to operate AVTEC ventilator fan(s), wash cycle and internal plenum and duct collar fire protection system. Control panel to be 18 gage stainless steel and shall house all electrical and plumbing components.

Electrical components to consist of FAN START, FAN STOP/WASH START & RESET buttons, adjustable auto wash timer, 0 to 10 minutes, detergent pump prime switch, and thermal detector switch. RESET button to interrupt FAN ON or WASH ON modes.

Plumbing components to consist of ball type shut off valve, wye-strainer, pressure-temperature gage, shock absorber, solenoid valve, detergent pump and 2 gallon reservoir.

All components to be pre-wired and pre-plumbed ready for field connection by applicable trades.

### ACCESSORIES

☐ Provide illuminated STOP/START buttons.
☐ Provide (panel mounted) & (remote) manual pull fire switch.
☐ Provide vent light switch.
☐ Provide (integral 5 gal.) (remote 5 gal.) (remote 25 gal.) detergent tank (and pump).
☐ Low Level Detergent Indicator with Audio Alarm

### OPTIONAL

☐ Provide micro-switch in lieu of thermal detector to operate fan and wash spray in fire condition, upon signal from fusible link damper.

form no. 14001D rev. 993 ©1993 AVTEC Industries Inc.

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Delfield

Project _____

Item Number #73

Quantity _____ Date _____

Approval _____

# SHRI-S/SHRI-G

## Supremacy Series™ Solid/Glass Heated Roll-In

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon-insulated double-pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**SINGLE VOLTAGE MODELS ONLY**

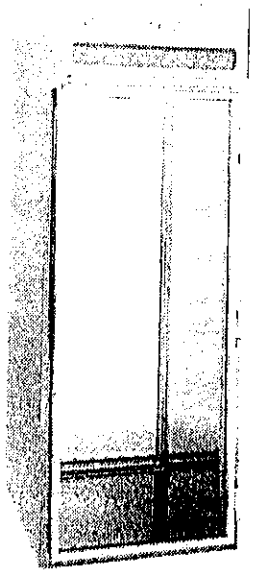
Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

**OPTIONS & ACCESSORIES**

Stainless steel backs
Laminate on doors & ends
Tray Slides
Kick panels
Remote refrigeration
Correctional Facilities package



MODEL SHRI2-G

c UL NSF UL 404A

The Delfield Company, P.O. Box 470, Mt. Pleasant, MI 48804-0470, U.S. A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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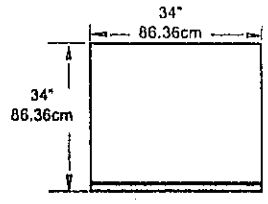
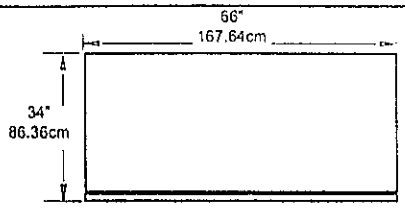
# SHRI-S/SHRI-G

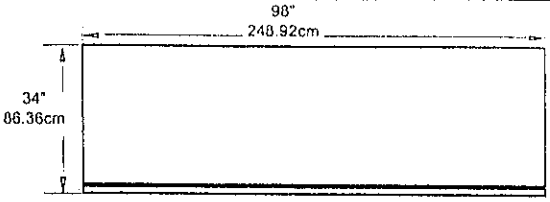
## Supremacy Series™ Solid/Glass Heated Roll-In



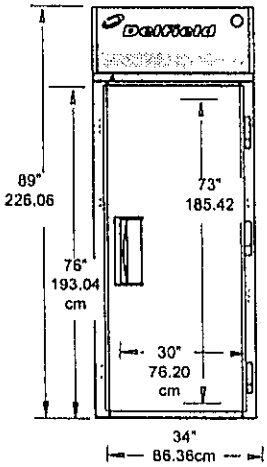

PLAN VIEW



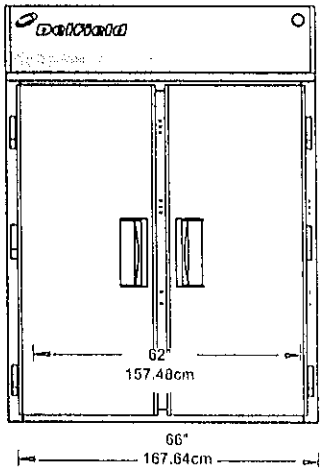

PLAN VIEW



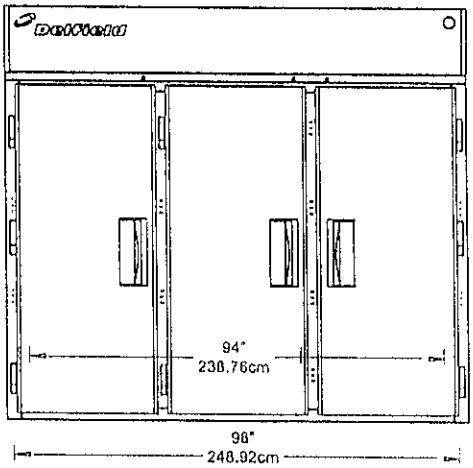

PLAN VIEW



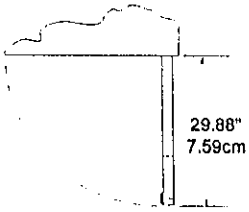

FRONT ELEVATION



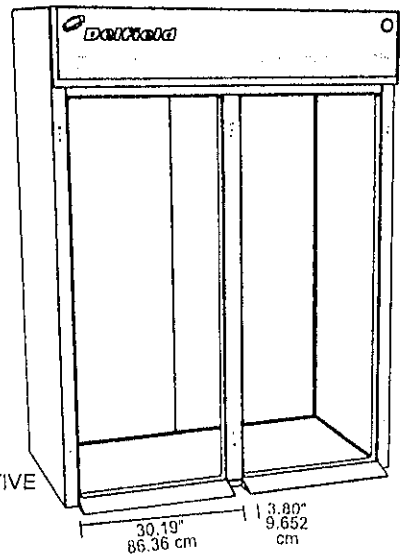

FRONT ELEVATION



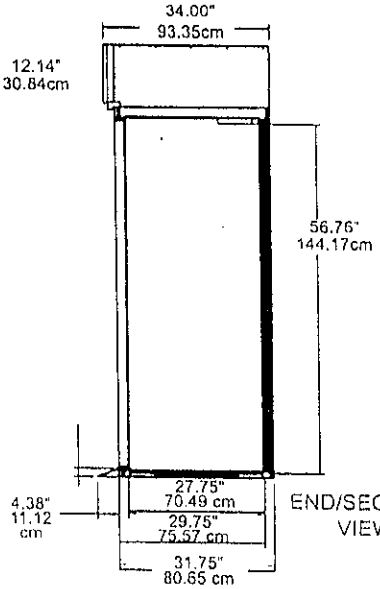

FRONT ELEVATION




DOOR CLEARANCE DETAIL




PERSPECTIVE VIEW




END/SECTION VIEW

## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | RACK CAP. | UNIT H.P. | BTU/HR CAB LOAD | BTU/HR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| REFRIGERATORS | | | | | | | | | | | |
| SHRI1-S | 115/208-230 | 13 | 37.7 | NA | NA | 1 | NA | NA | NA | 870 | NA |
| SHRI2-S | 115/208-230 | 13 | 77.92 | NA | NA | 2 | NA | NA | NA | 1334 | NA |
| SHRI3-S | 115/208-230 | 13 | 118.14 | NA | NA | 3 | NA | NA | NA | 1690 | NA |
| SHRI1-G | 115/208-230 | 13 | 37.7 | NA | NA | 1 | NA | NA | NA | 895 | NA |
| SHRI2-G | 115/208-230 | 13 | 77.92 | NA | NA | 2 | NA | NA | NA | 1380 | NA |
| SHRI3-G | 115/208-230 | 13 | 118.14 | NA | NA | 3 | NA | NA | NA | 176 | |

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DSSRLH 09/01

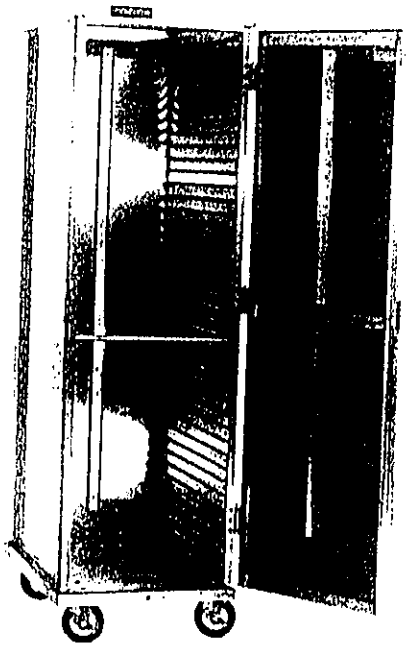
CRES COR®

JOB:
ITEM NO: #73

# NON-INSULATED EXTRUDED SIDEWALL UTILITY CABINETS 150 SERIES

## FEATURES AND BENEFITS:

- Non-insulated all purpose cabinet for transport and storage.
- Same size top and base extend past sidewalls to act as natural bumpers for protection. Extruded frame fully welded.
- Body constructed of non-corrosive, Hi-Tensile aluminum for strength and ease of mobility.
- Reinforced, full length door swings 270° and can be latched to the cabinet side for convenience. Card clip included.
- Gravity type latch secures door during transport.
- Interlocking extruded sidewalls hold 18" x 26" pans and plastic food boxes on 1-1/2" centers. Easy to clean.
- Interior pan stops on door and back allow proper air flow.
- Heavy duty 5" swivel casters, two with brakes. Provides mobility when fully loaded.



150-1840C

NSF

ACCESSORIES and OPTIONS (Available at extra cost):

- ☐ Lock Hasp
- ☐ Various Caster Options
- ☐ Corner Bumpers
- ☐ Perimeter Bumper
- ☐ Floor Lock (for use with 5" casters)
- ☐ Plexiglas Door
- ☐ Push Handle
- ☐ Bail Handle Kit
- ☐ Left-Hand Hinged Door
- ☐ Kold Keepers

See page A-20 for accessory details.

CRES COR®

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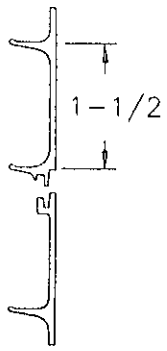
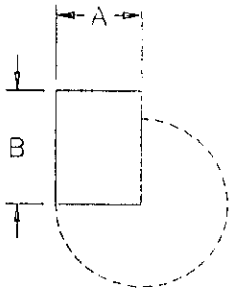
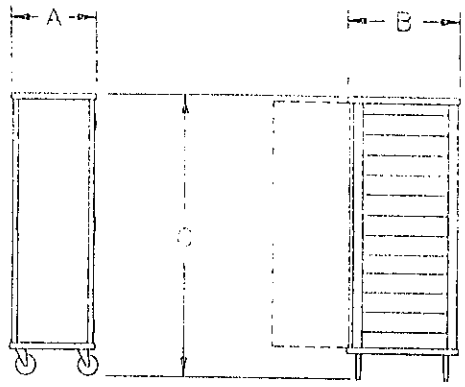



DETAIL OF
PAN SLIDE




| CRES-COR MODEL NO. | PAN CAP | PAN SIZE | | DIM "A" WIDTH | DIM "B" DEPTH | DIM "C" HEIGHT | INSIDE DIMENSIONS WIDTH | INSIDE DIMENSIONS DEPTH | INSIDE DIMENSIONS HEIGHT | | WEIGHT ACT. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 150-1840C | 40 | 18 X 26 | IN | 21 | 31 | 69-3/4 | 18-1/16 | 28-1/2 | 61-1/2 | LBS | 115 |
| | | 45.7 X 66.0 | CM | 53.3 | 78.7 | 177.2 | 45.9 | 72.4 | 156.2 | KG | 52 |
| 150-1836C | 36 | 18 X 26 | IN | 21 | 31 | 63-3/4 | 18-1/16 | 28-1/2 | 55-1/2 | LBS | 105 |
| | | 45.7 X 66.0 | CM | 53.3 | 78.7 | 161.9 | 45.9 | 72.4 | 141.0 | KG | 48 |

Vhen ordering bumpers, add 2" to overall dimensions.

.LL ALUMINUM CONSTRUCTION IS RIVETED, WELDED AND FINISHED.

## :ABINET:

Posts: Extruded channels, 7/8 x 2-1/4 x .102, welded to top and base, form a solid frame.

Sides: Interlocking extruded 6" panels, smooth outer sides.

Back panel: Fitted into posts, riveted to top and reinforced.

Tie rod: Applied at front.

Top: One piece .100 aluminum.

Pan stop channels: Mounted to inside rear of cabinet and door.

## ASE:

One piece construction, .190 aluminum.

Casters: 5" dia., swivel, neoprene tires, 1-1/4 wide, load cap. 200 lbs. each, temp. range -20°/+160°F. Bearings are sealed and permanently lubricated. Front casters equipped with brakes.

## OOR:

Panel: .063 brushed aluminum, fitted into door stile extrusions, 3/4 x 1-7/16 x .187.

Reinforcement: 1/4 x 1-1/2 extruded bars riveted and welded horizontally to top, center and bottom.

Latch: Gravity type, nickel plated steel.

Swings 270° on 3 butt hinges, riveted to posts and stiles.

## PAN SLIDES:

- Extruded interlocking side walls act as pan slides on 1-1/2" centers.

## SHORT FORM SPECIFICATIONS

Cres-Cor Utility Cabinet Model 150-18____C. Formed and welded .100 aluminum top, .190 aluminum base. Interlocking extruded aluminum sidewalls for (___) 18" x 26" pans and plastic food boxes on 1-1/2" centers. Brushed .063 aluminum door, full frame welded construction. 5" swivel neoprene casters, permanently lubricated, sealed ball bearings. Load capacity 200 lbs. each. Provide the following accessories: ____ ____ ____. NSF listed. 2 year parts warranty.

CRES COR®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Phone: 877/CRESCOR • Fax: 440/350-7267
www.crescor.com



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*In line with its policy to continually improve its products, CRES-COR reserves the right to change materials and specifications without notice.*


Made in U.S.A.

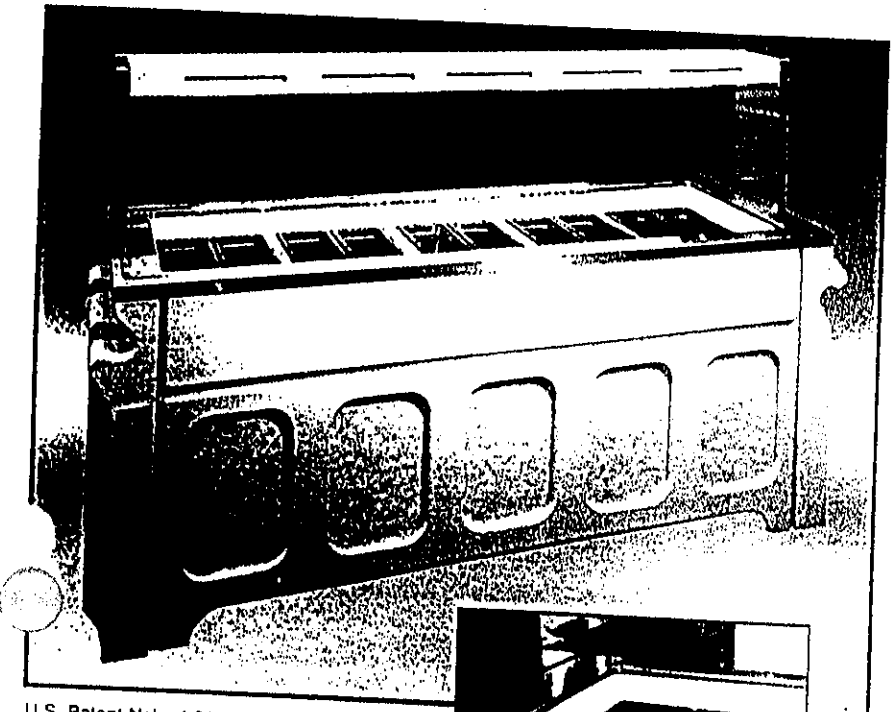
# Galley® Line

Item No. 75

## Sanitary, Heavy Duty
## Self-Service 10" Deep
## Refrigerated Cold Pan Module
## NSF Standard 7 Version

**Model No. 9630**
**Model No. 9640**
**Model No. 9650**

AIA11420

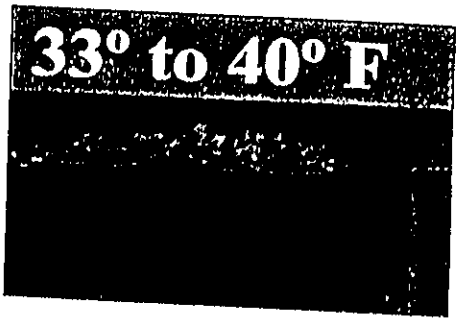


U.S. Patent No's. 4,013,880 and 4,008,931
Model 9650, 79" width module shown with optional buffet canopy #8742

NSF

THE GALLEY PORTAFROST – Ideal for self-service foods that must refrigerated at a constant 33°F. Used for salads, cold desserts, milk shakes, cold cuts, cheeses, spreads, juices, fresh fruits and melons. Ten-inch deep cold pan provides a 3" cold blanket which keeps the hot air out and foods between 33°F and 40°F.

- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.
- Aesthetic design, three neutral colors, dove white, pewter tan or black pearl, blends in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.




| Cat. No. | Module Size W | Module Size D | Module Size H | Pan Size W | Pan Size D | Pan Size H | Volts | Amps | Phase | Comp. H.P. | Hz | Quantity of Decorator Panels Included | Shpg. Wt. Lbs. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9630 | 50" | 28" | 36" | 41" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 3 | 310 |
| 9640 | 64 7/8 | 28" | 36" | 55 1/4" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 4 | 364 |
| 9650 | 79" | 28" | 36" | 70" | 19 7/8" | 10" | 120 | 6.1 | 1 | 1/4 | 60 | 5 | 418 |

* All models 1/4 Horsepower. Includes removable drain bases.

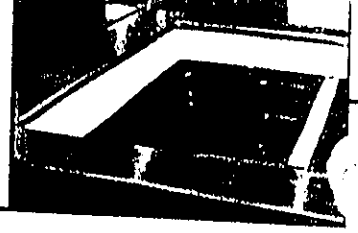
To be ***Galley® Line*** 10" Deep Refrigerated Cold Pan Unit, Model _____ with accessories as specified.

**GENERAL:** Unit to be self-contained, stainless steel, mobile self-service 10" deep Refrigerated Cold Pan module for refrigerator temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-lock- and aligning end panels allow modules to be interconnected. To e recessed push handles at each end. Side skirts to be remov- for access to compressor and controls. Side skirts to be sed to accept decorator panels. Server's side to be open to ccept accessories. To be listed by National Sanitation Foundation.

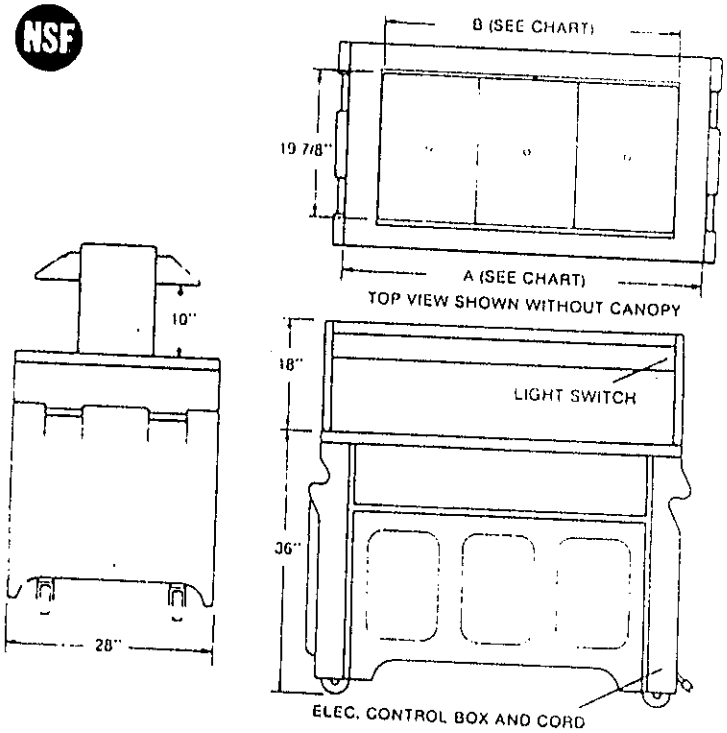
**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal under-carriage. 14 ga. 300 series stainless steel top to have not less than #4 finish. Optional Buffet canopy contains fluorescent light. One-piece acrylic breath-guard is removable. Canopy is supported by stainless steel uprights and covered with flame retardant ABS formed plastic. To have removable white low-gloss-ABS plastic drain base. Cold pan drain to include hose and shut-off. Insulated cold pan to be constructed of 300 series stainless steel and shall be 10" deep. The pans are to be set on a ledge 3" below the top surface and surrounded with frost. The cold pan refrigeration system to be a 1/4 h.p. hermetically sealed condensing unit. Condensing unit to be fully enclosed in a corrosion resistant ventilated housing. Plate mounted 4" diameter swivel casters with toe brakes to be provided. Power supply cord to be 6 feet in length. NEMA plug configuration to be 5-15P. To be used with a branch circuit rating of 15 amps, single pole. Power supply cord to be 14 AWG, 3 conductors.

# Galley Line

## 10" Deep Refrigerated Cold Pan Module
## NSF Standard 7 Version Model No's 9630, 9640, 9650



SPECIFICATION DRAWING OF BASIC UNIT WITH BUFFET CANOPY




| Cat. No. | Dim 'A' | Dim 'B' |
|---|---|---|
| 9630 | 50" | 41" |
| 9640 | 64 ½" | 55 ½" |
| 9650 | 79" | 70" |

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications.

**ACCESSORIES:**

A. Decorator panels, specify catalog number and quantity. (See chart on front side.)
- ☐ Catalog No. 8700 American Walnut, Quantity_____ Included.
- ☐ Catalog No. 8701 Teakwood, Quantity_____.
- ☐ Catalog No. 8702 Plain Custom Panel, Quantity_____.
- ☐ Catalog No. 87xx Custom Laminate, Quantity_____.

B. Food Bar Adapters. Adapter bar for use when 12 x 20 pans are placed in cold pan to cover top opening.
- ☐ Catalog No. 8751. Model 9630 requires two. Model 9640 requires three. Models 9650 requires four. Quantity_____.

C. Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
- ☐ Catalog No. 8773, (*Short 50") 42⅞" width, used on 9231.
- ☐ Catalog No. 8774, 50" width, used on model 9231.
- ☐ Catalog No. 8775, (*Short 64 ½") 57⅜" width, used on 9241.
- ☐ Catalog No. 8776, 64 ½" width, used on model 9641.
- ☐ Catalog No. 8777, (*Short 79") 71⅞" width, used on 9651.
- ☐ Catalog No. 8778, 79" width, used on model 9651.

*Note: A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

D. Folding Cutting Board. All plastic. Mounted flush on server's side.
- ☐ Catalog No. 8763, 50" width, used on model 9231.
- ☐ Catalog No. 8764, 64 ½" width used on model 9241.
- ☐ Catalog No. 8765, 79" width used on model 9251.

E. Extension shelf. Stainless steel. Mounted flush with top of module. Self-mounting. 16" wide x 28" deep.
- ☐ Catalog No. 8754.

F. "Mateflat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5⅜"W x 28"D x 36"H.
- ☐ Catalog No. 8761. Male panel (fits female end).
- ☐ Catalog No. 8762. Female panel (fits male end).

G. Food Protector.
- ☐ Catalog No. 8780, use with 50" width unit.
- ☐ Catalog No. 8781, use with 64 ½" width unit.
- ☐ Catalog No. 8782, use with 79" width unit.

H. Food Protector with Lights.
- ☐ Catalog No. 8791, use with 50" width unit.
- ☐ Catalog No. 8792, use with 64 ½" width unit.
- ☐ Catalog No. 8793, use with 79" width unit.

I. Double Deck Display Stand without lights.
- ☐ Catalog No. 8785, use with 50" width unit.
- ☐ Catalog No. 8786, use with 64 ½" width unit.
- ☐ Catalog No. 8787, use with 79" width unit.

J. Double Deck Display Stand with Lights.
- ☐ Catalog No. 8788, use with 50" width unit.
- ☐ Catalog No. 8789, use with 64 ½" width unit.
- ☐ Catalog No. 8790, use with 79" width unit.

K. Flat End Panel.
- ☐ Catalog No. 8731 Replaces Female "matelock"
- ☐ Catalog No. 8732 Replaces Male "matelock".

L. Buffet Style Canopy.
- ☐ Catalog No. 8740, use with 50" width unit.
- ☐ Catalog No. 8741, use with 64 ½" width unit.
- ☐ Catalog No. 8742, use with 79" width unit.

M. Close Off for server's side.
- ☐ 8734, use with 50" width unit.
- ☐ 8735, use with 64 ½" width unit.
- ☐ 8736, use with 79" width unit.

N. Undercounter Shelving.
- ☐ Catalog No. 8752 Only used on 9640.
- ☐ Catalog No. 8757 Only used on 9650.

No other undershelves can be used on refrigerated modules.

**Specifications subject to change without notice.**



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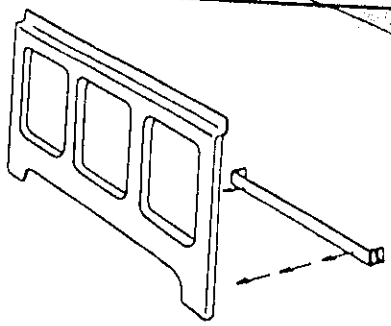
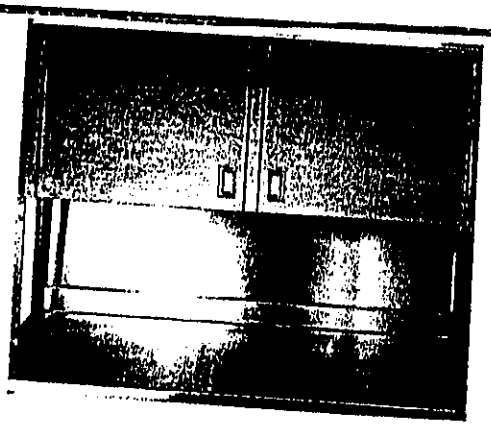
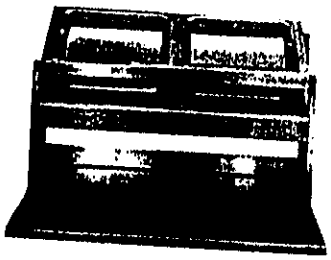
☐ **No. 8723 Divider Tray.** 17½" x 19 1/16" aluminum tray to hold milk cartons, shakes, dixie cups and other products in a refrigerated unit.



☐ ~~**No's. 8733, 8734, 8735,**~~ **8736 Close-Off Back Panel.** Material to be of flame retardant ABS formed plastic. Removable close-off side panel to be recessed too accept decorator panels.

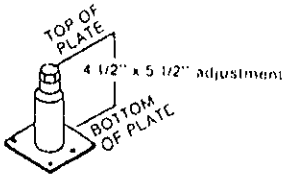


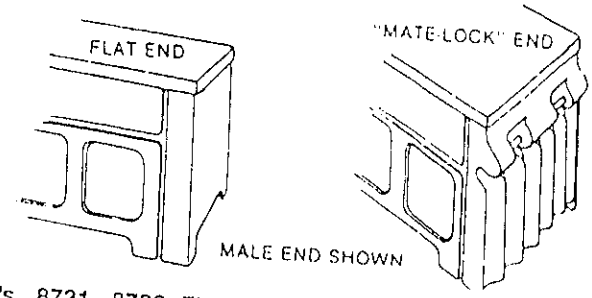
☐ **No's. 8960, 8961, 8962, 8963 Wall Hutch.** Material to be #4 polish stainless steel with stainless steel doors, recessed latches, locks & keys, stainless steel wall guard, and stainless steel shelves.



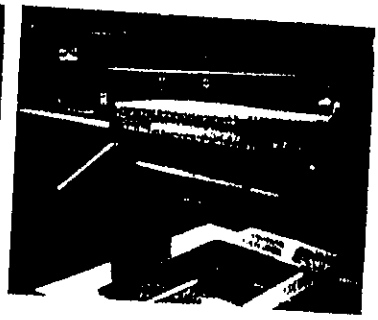
☐ **No's. 8624, 8625, 8626, 8627 Recessed & Angled Display Shelves.** Material to be #4 polish stainless steel with slanted shelves with cut outs for food service pans. May be mounted back to back for double service.

☐ **No. 8783 Bullet Feet (Set of 4).** Plated metal legs with 1" adjust-
t. Used in lieu of casters.

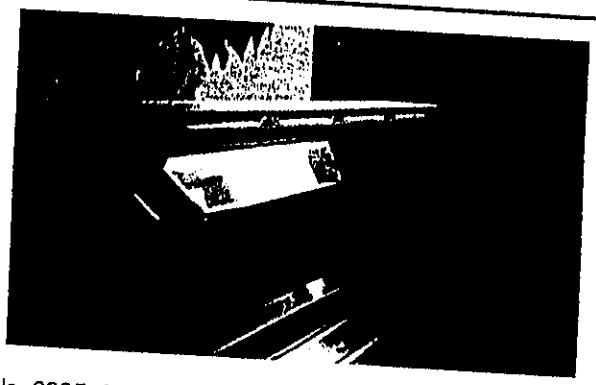


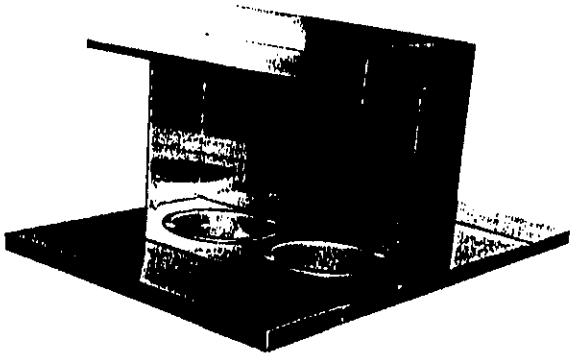

☐ **No's. 8731, 8732 Flat End Panel (Replaces Male/Female "Matelock").** Neutral colors, dove white, pewter tan or black pearl. Made of flame retardant ABS formed plastic material. Panel allows for squaring end of module to wall where necessary. 8731 fits female. 8732 fits male.



☐ **No's. 8639, 8640, 8641 Safety Glass** framed in stainless steel in lieu of Plastic for heat lamp canopy and **No. 8978 Lift Up Option.**



☐ **No's. 8895, 8897, 8898, 8899 Safety Glass** framed in stainless steel in lieu of Plastic for lighted buffet canopies.



☐ **No's. 8719, 8943 Soup Cup Shelf.** Stainless steel with side walls & rear wall cup retainers. Shown with optional plate rests and soup wells.



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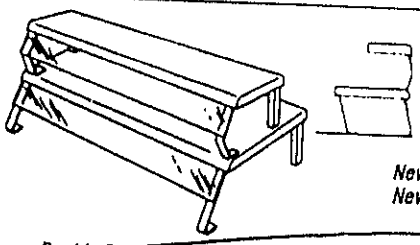
# Galley Line ITEMS#75

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

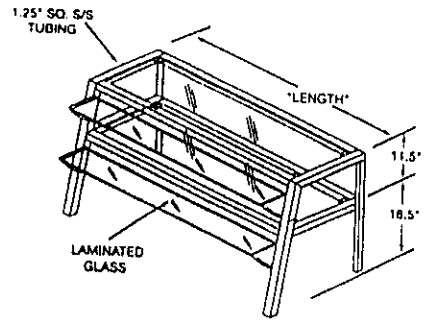
## Food Protectors

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Pewter Tan, Dove White or Black Pearl Shelves:** | | | | | | | | |
| Unlighted | 8797 | 92 | 8785 | 97 | 8786 | 103 | 8787 | 108 |
| Lighted | 8819 | 107 | 8788 | 112 | 8789 | 118 | 8790 | 124 |
| **Stainless Steel Shelves:** | | | | | | | | |
| *New!* Unlighted | 8646 | 92 | 8647 | 97 | 8648 | 103 | 8649 | 108 |
| *New!* Lighted | 8749 | 107 | 8795 | 112 | 8798 | 118 | 8799 | 124 |
| Safety Glass | 8628 | 50 | 8629 | 75 | 8630 | 106 | 8631 | 125 |
| **Replacement Items:** | | | | | | | | |
| Breath Guard | 7002321 - 2 Required | | 7001172 - 2 Required | | 7001173 - 4 Required | | 7001173 - 4 Required | |

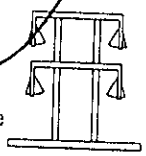


**Double Deck Display, Solid Shelves**

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Double Deck Glass Shelves and Adjustable Glass Breath Protector** | | | | | | | | |
| Single Service, Unlighted | 8616 | 192 | 8617 | 197 | 8618 | 203 | 8619 | 208 |
| Double Service, Unlighted | 8632 | 210 | 8633 | 212 | 8634 | 218 | 8684 | 224 |
| Single Service, Lighted | 8970 | 202 | 8971 | 217 | 8972 | 223 | 8973 | 228 |
| Double Service, Lighted | 8974 | 220 | 8975 | 232 | 8976 | 238 | 8977 | 244 |
| Single Deck, Glass Shelf and Adjustable Glass Breath Protector Unlighted | 8517 | 100 | 8518 | 115 | 8519 | 130 | 8520 | 145 |

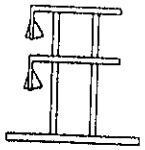


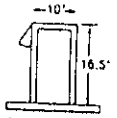

**Double Deck Glass Display (Single Service Shown)**



Double Service

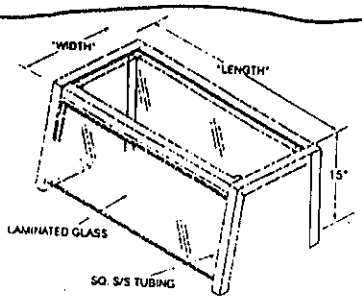
Single Service





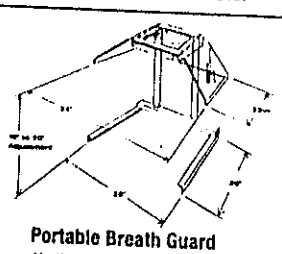

Single Deck

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Single Deck Glass Top Food Protector** Unlighted | 8904 | 140 | 8905 | 150 | 8906 | 162 | 8907 | 174 |
| **Single Deck Stainless Steel Top Food Protector** Unlighted | 8932 | 120 | 8933 | 130 | 8934 | 142 | 8935 | 154 |
| Lighted | 8936 | 135 | 8937 | 145 | 8938 | 157 | 8939 | 169 |
| **Verticle Glass Protectors** Up to 28" High in Stainless Frame | 8913 | 100 | 8914 | 110 | 8915 | 120 | 8916 | 130 |
| **For Corners** | 8917 | 125 | | | | | | |

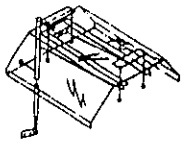



**Single Deck Glass Protector**

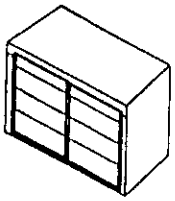
| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Portable Breath Guard Unlighted;** For use on 9011,9012, 9310, etc. | 8724 | 70 | 8724 | 70 | 8724 | 70 | 8724 | 70 |
| *New!* **Corner Breath Guard** Fixed, Unlighted; | 8720 | 70 | | | | | | |
| **Replacement Items:** | | | | | | | | |
| Breath Guard | 7001771 | | 7001771 | | 7001771 | | 7001771 | |
| Knurled Knobs | 2502033 - 4 Required | | 2502033 - 4 Required | | 2502033 - 4 Required | | 2502033 - 4 Required | |



**Portable Breath Guard**
Vertical adjustment to 20"

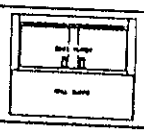


| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Pass Thru / See Thru Refrigerated Display Merchandisers** Sliding Glass Doors on both sides. Prices include complete installation in Galley Module. Compressor Mounted in Module Base. | Not Available Refrigerated Base with Compressor | | 8908 Not Available 1/2 HP 12 Amps 115 / 60 / 1 | 550 | 8909 3/4 HP 16 Amps 115 / 60 / 1 | 675 | 8910 3/4 HP 16 Amps 115 / 60 / 1 | 825 |
| | | | | | 8982 | 250 | 8983 | 275 |



**erated Display Merchandiser Pass Thru / See Thru**

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Over Counter Wall Hutch with** Doors, Shelves & Wall Guard All S/S | 8960 | 250 | 8961 | 350 | 8962 | 400 | 8963 | 450 |





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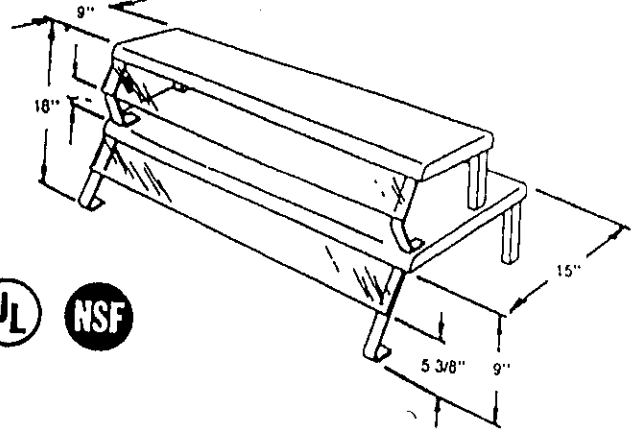
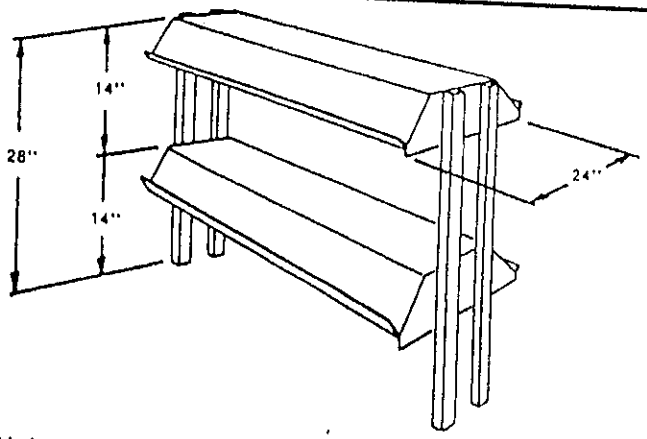
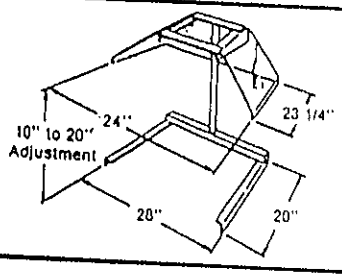


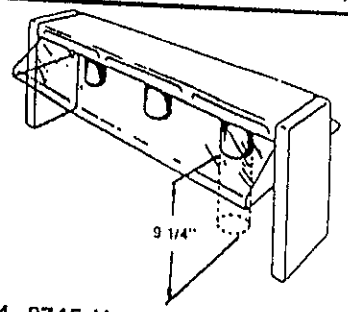

☐ **Double-Deck Display Stand.** To be full width x 18"H x 15"D (overall). To be one of two neutral colors, dove white or pewter tan. Shelving to be of ABS plastic material and supported by two contoured stainless steel uprights. Bottom shelf to be 15"D. Top shelf to be 9" D. Top and bottom acrylic "see-thru" plastic breathguards are easily removable for cleaning. Available on all Cold Pan, Refrigerated Cold Pan and Utility Table Modules.




☐ **No's. 8713, 8714, 8722 Merchandising Shelf.** Stainless steel construction. Designed to be used with baskets or pans.

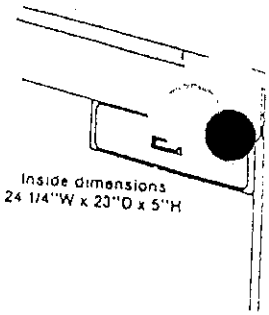
☐ **No. 8724 Portable Breathguard.** Portable free-standing acrylic breathguard. Is adjustable and has a stainless steel frame. Fits on 28" Module.

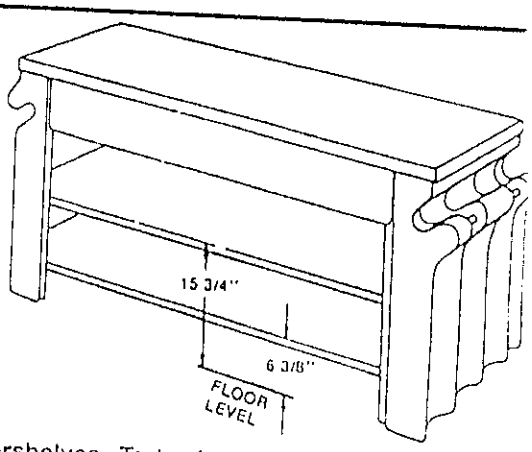



☐ **No's. 8743, 8744, 8745 Heat Lamps Canopy.** Available for 50", 64 ½" and 79" modules in lieu of the standard fluorescent lamp canopy. Each canopy lamp is independently controlled and uses 125 watt bulbs. Canopy size: 24" x 28" x full width.

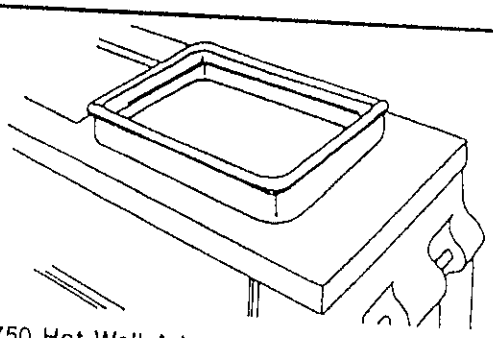
☐ **No. 8760 Utility Drawer.** To be all stainless steel construction and to include lock and removable plastic liner. Outside dimensions are 24 ¼"W x 23"D x 5¼"H. Inside dimensions are 24 ½"W x 23"D x 5"H. Factory installed. Available on Hot Food, Cold Pan, and Utility Table Modules (except Model 9310).



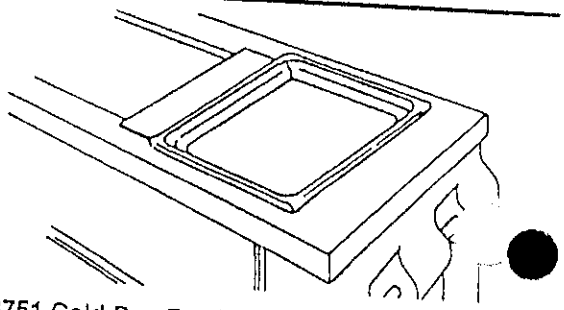




☐ **Undershelves.** To be full width of module interior x deep with 1" turned-down front edge. To be all stainless and easy to remove. Maximum: two shelves per mo Lower shelf to be 6 ⅜" from floor and upper sh 1 from the floor. Available on Hot Food, Cold Par er Cold Pan, and Utility Table Modules. Specify by width, ca number and specify quantity.

Two sets of shelf brackets are installed in case shelves a ordered later.



☐ **No. 8750 Hot Well Adapter.** (For using 6" deep pans top cutouts of hot food table modules). To be 20 ga. stainl steel. Approximate dimensions: 12 ½" x 20 ½" x 2". A ½" projects into food well to keep collar in place.



☐ **No. 8751 Cold Pan Food Pan Adapter Bar.** For use wi 12" x 20" pans in both cold or refrigerated cold pan modul for covering top opening.



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# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| *New!* 45° Corner Inside | 8770A | 12 | | | | | | |
| *New!* 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029

**Trayslides (8774 Shown)**

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7/8" | |
| *New!* Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| *New!* **Stainless Plate Rest:** | | | | | | | | |
| *New!* Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843. | | | | | | | | |
| *New!* **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| *New!* **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

#8998

**Cutting Boards, Stainless Plate Rests, Extended Tops**

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |

8733 8734 8735 8736

**Closure and Access Panel (8734 Shown)**

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. **Note: #9230, #9231, & #9630** cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |

**Undershelf (2 Shown)**

**Interior Stainless End Liners (Not Shown)**



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Delfield

Project _____

Item Number #78

Quantity _____ Date _____

Approval _____

# SRRI-S/SFRI-S

## Supremacy Series™ Solid Door Roll-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon-insulated double-pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

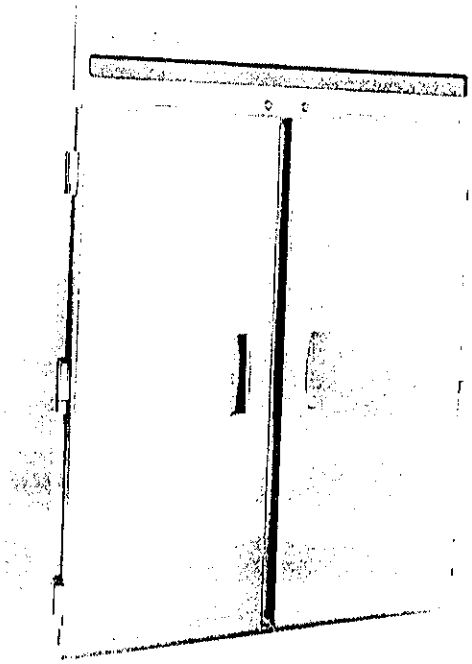
Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain –10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.



MODEL SRRI2-S

**OPTIONS & ACCESSORIES**

Stainless steel backs
Laminate on doors & ends
Tray Slides
Kick panels
Remote refrigeration
Correctional Facilities package
ERC-2 microprocessor - based controls

***NOTES:***

*Bottom to be reinforced with 14 gauge castor channels. All units to be supplied with easily – attachable 16 gauge stainless steel ramps, 1 per door opening. Wiper gasket shall be provided on bottom of door for seal to ramp. Units shall have a removable 14.0" (35.6cm) "sleeper" section to facilitate installation; an optional 20.0" (50.8cm) "sleeper" section shall be available.*

c UL NSF UL 404A

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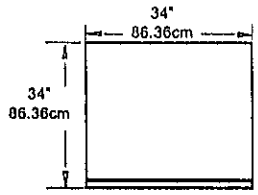
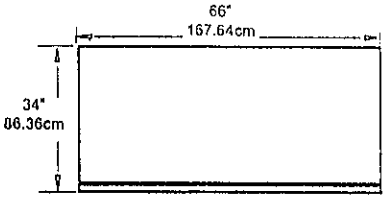
Delfield

# SRRI-S/SFRI-S

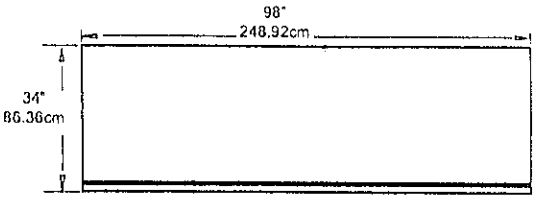
## Supremacy Series™ Solid Door Roll-In Refrigerators and Freezers



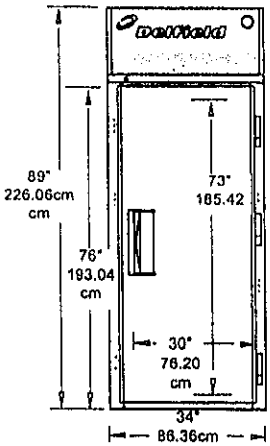

PLAN VIEW



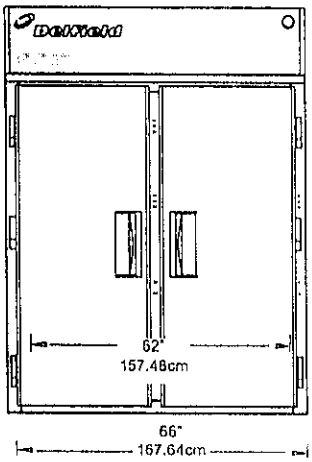

PLAN VIEW



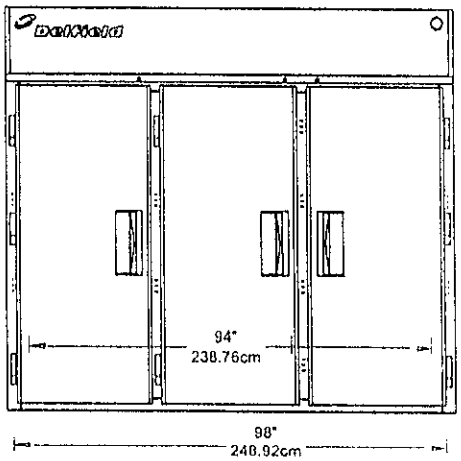

PLAN VIEW



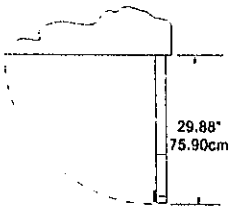

FRONT ELEVATION



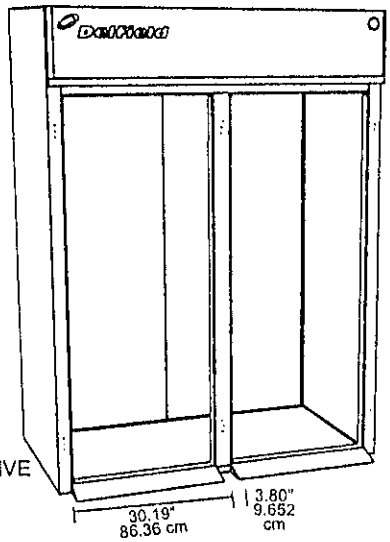

FRONT ELEVATION



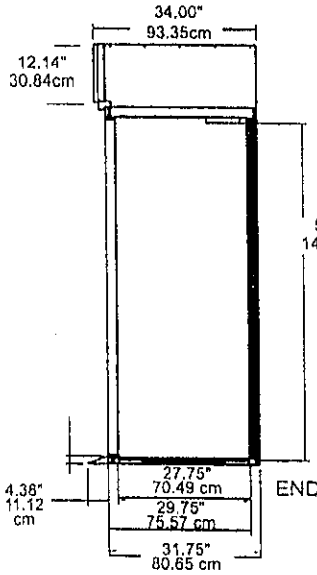

FRONT ELEVATION




DOOR CLEARANCE DETAIL




PERSPECTIVE VIEW




END/SECTION VIEW

## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | RACK CAP. | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **REFRIGERATORS** | | | | | | | | | | | |
| SRRI1-S | 115 | 10.5 | 37.7 | NA | NA | 1 | 1/3 | 1207 | 3300 | 874 | 5-15P |
| SRRI2-S | 115 | 12.0 | 77.92 | NA | NA | 2 | 1/2 | 2221 | 3300 | 1334 | 5-15P |
| SRRI3-S | 115 | 16.0 | 118.14 | NA | NA | 3 | 3/4 | 2700 | 5400 | 1696 | 5-20P |
| **FREEZERS** | | | | | | | | | | | |
| SFRI1-S | 115 | 12.0 | 37.7 | NA | NA | 1 | 1/2 | 1450 | 2400 | 934 | 5-20P |
| SFRI2-S | 208-230 | 12.0 | 77.92 | NA | NA | 2 | 1 | 2900 | 5000 | 1424 | 5-20P |
| SFRI3-S | 208-230 | 16.0 | 118.14 | NA | NA | 3 | 1 1/2 | 4350 | 7000 | 1816 | 14-20P |

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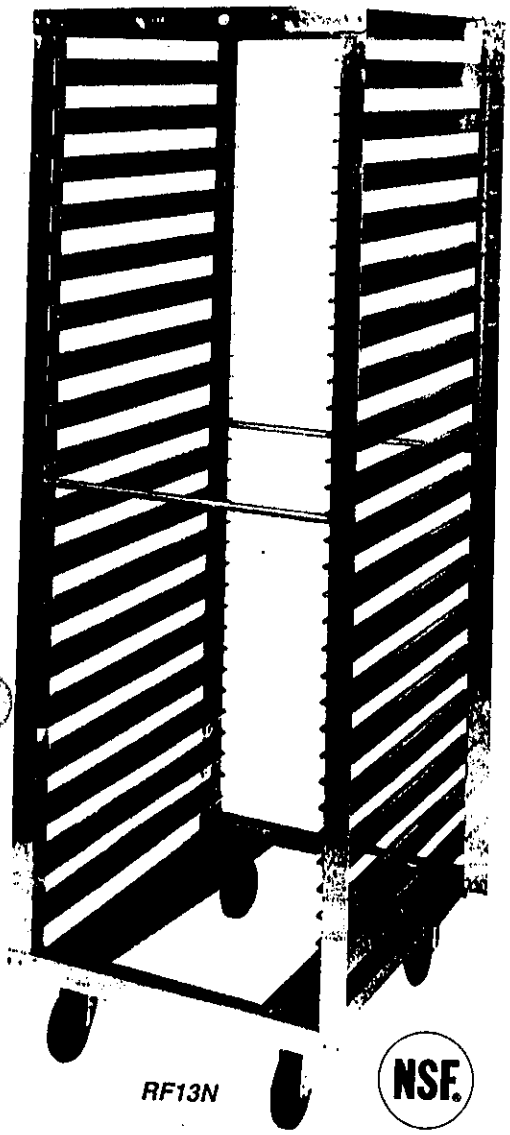
DSSRL 09/01

METRO

Item# #78

Job



RF13N

NSF

METRO MOBILE

# ROLL-IN REFRIGERATOR RACKS

- **Material:** Special design, natural finish, high-strength, extruded aluminum (6063-T6 alloy).
- **Rugged:** Aircraft-riveted construction throughout...means additional strength.
- **Pass-Thru Design:** Can be loaded on one side and unloaded from the other for maximum efficiency and convenience.
- **Sized To Fit Refrigerator:** Rack rolls directly into refrigerator for quick and easy storage. You save valuable handling time and expensive labor costs.
- **Lightweight and Freewheeling**
- **Sanitary:** Easy to clean.
- **Rapid Cooling Saves Energy**





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Wilkes-Barre, PA 18705
www.metro.com

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Job_____

METRO MOBILE

# ROLL-IN REFRIGERATOR RACKS

## SPECIFICATIONS:

**Materials:** Special design, natural finish, high-strength, extruded aluminum (6063-T6 alloy).

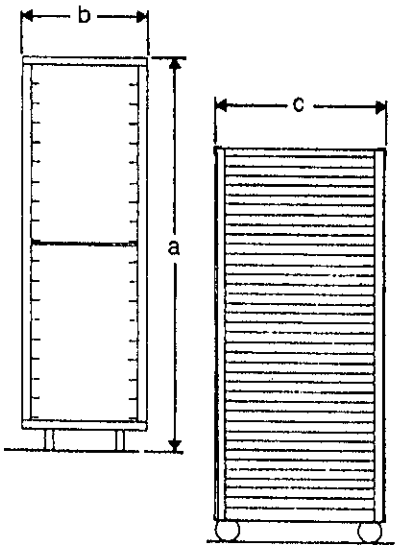
**Construction:** Pass-thru design, aircraft-riveted construction throughout.

**Corner Posts:** 1½" x 1½" x ⅛" angle-shape. (Except RF20N, RF29N: 1" x 1½" x ⅛")

**Top & Bottom:** 1½" x 1½" x ⅛" angle-shape riveted to four corner posts. (Bottom closed on RF78N.)

**Casters:** Two A5L on back–5" ball bearing swivel, self-lubricating axle, rubber-wheeled, zinc-plated, bolted to full-length 14-gauge channel to bottom frame. Two A5LB on front– same as above with wheel brake. (Except two B5DN and two B5DNB on RF78N.)

**Slides:** RF3N and RF23N, .060" x 1¼" x 1½" bulb-tipped angle. RF13N and RF20N, .060" x ½" x 1½" extruded aluminum channel. RF29N, 18-gauge x ½" x 1½" stainless steel channel. RF78N, 12 sets extruded vari-slides, adjustable on 1½" centers, 3" minimum slide spacing.




## DIMENSIONS:

| | (a) Height | | Without Bumper (b) Width | | (c) Depth | | With A33 Bumper (b) Width | | (c) Depth | | Slide Spacing | | Pan Capacity | | Shipping Weight | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Model No. | (in.) | (mm) | (in.) | (mm) | (in.) | (mm) | (in.) | (mm) | (in.) | (mm) | (in.) | (mm) | no. | Size (in.) | (lbs.) | (kg) |
| RF13N | 64 | 1600 | 21¼ | 540 | 26 | 660 | 23¼ | 590 | 28 | 710 | 1½ | 38 | 36 | 18x26 | 44 | 20 |
| * RF3N | 64 | 1600 | 21⅜ | 543 | 26 | 660 | 23⅜ | 595 | 28 | 710 | 3 | 76 | 18 | 18x26 | 55 | 25 |
| RF23N | 64 | 1600 | 21⅜ | 543 | 26 | 660 | 23⅜ | 595 | 28 | 710 | 5 | 127 | 11 | 18x26 | 43 | 19 |
| RF78N | 64½ | 1610 | 24⅜ | 630 | 26 | 660 | 26⅜ | 670 | 28 | 710 | see Note 1 | | see Note 1 | | 92 | 41 |

**NOTE:** Swivel casters, two with brakes, are standard on the units listed above.
**NOTE 1:** Pan capacity with 12 sets of slides on 4½" centers.

## ACCESSORIES

| Model | |
|---|---|
| A33RD | Gray Continuous Bumper |
| A37 | Gray Corner Bumpers |
| A71 | Floor Lock with B5DN/B5DNB Casters Only |
| A121 | Extra Vari-Slides for RF78N |

| 2 per slide no. | 2 per slide size (in.) | 1 per slide no. | 1 per slide size (in.) |
|---|---|---|---|
| 24 | 10⅞ x 19¾ | 12 | 15x20 |
| 24 | 11⅛ x 20 | 12 | 18x26 |
| 24 | 12 x 18 | 12 | 20x20 |
| 24 | 12 x 20 | 12 | 20x22 |
| 24 | 13 x 18 | 12 | 20x24 |
| 24 | 14 x 18 | | |

**Manufactured by:**
**InterMetro Industries Corp.**
North Washington Street
Wilkes-Barre, PA 18705

For Product Information, call 1-800-433-2232



**InterMetro Industries Corporation**
North Washington Street
Wilkes-Barre, PA 18705
www.metro.com

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Printed in U.S.A.
Information and specifications are subject to change without notice. Please confirm at time of order.

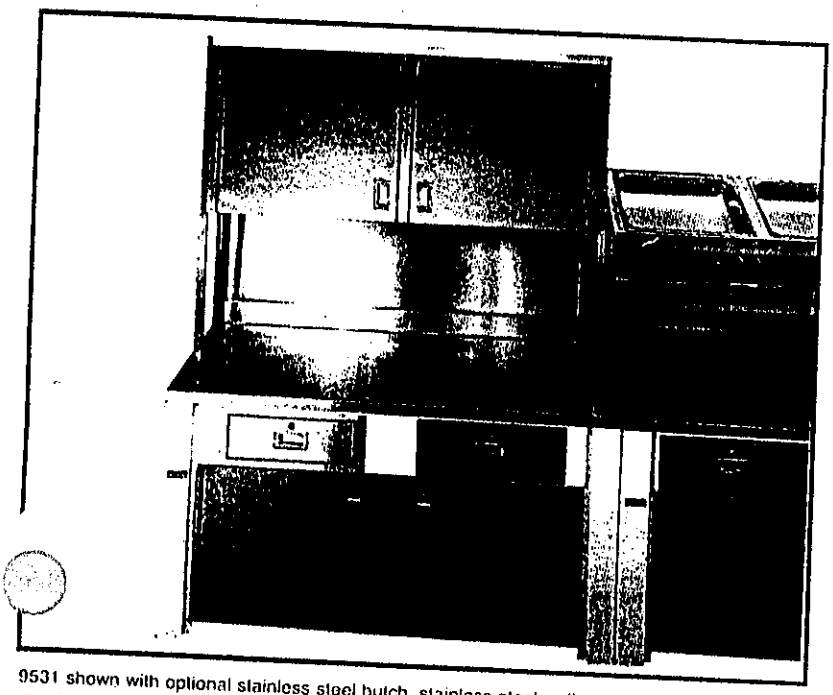
# Galley® Line

## Sanitary, Heavy Duty
## Storage Modules

Item No. # 81/81a

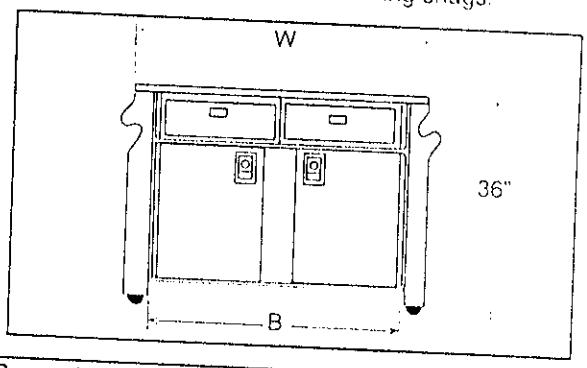
~~Model No. 9510~~
Model No. 9530
~~Model No. 9531~~
Model No. 9540
Model No. 9541
Model No. 9550
Model No. 9551

A1A11420



9531 shown with optional stainless steel hutch, stainless steel wall guard, stainless steel back splash, and flat ends.

- Aesthetic design, three neutral colors, dove white, pewter tan, or black pearl blend in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.
- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.




NSF

| Cat. No. | Module Size W | D | H | Dim B | Shpg. Wt. Lbs. | Quantity of Decorator Panels Required | Shelves | Doors | Drawers |
|---|---|---|---|---|---|---|---|---|---|
| 9510 | 28" | 28" | 36" | 17" | 200 | 1 | 2 | 1 | 0 |
| 9530 | 50" | 28" | 36" | 39" | 250 | 3 | 2 | 2 | 0 |
| 9531 | 50" | 28" | 36" | 39" | 250 | 3 | 2 | 2 | 2 |
| 9540 | 64 1/2" | 28" | 36" | 53 1/2" | 300 | 4 | 2 | 2 | 0 |
| 9541 | 64 1/2" | 28" | 36" | 53 1/2" | 300 | 4 | 2 | 2 | 2 |
| 9550 | 79" | 28" | 36" | 68" | 350 | 5 | 2 | 2 | 0 |
| 9551 | 79" | 28" | 36" | 68" | 350 | 5 | 2 | 2 | 2 |

To be **Galley® Line** Storage Module_____ with accessories as specified.

**GENERAL:** Unit to be self-contained, mobile storage module for room temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-[illegible]g and aligning end panels allow modules to be interconnect-[illegible] have recessed pouch handles at each end. Removable side [illegible] on one side to be recessed to accept decorator panels. [illegible]tainless steel door(s) have recessed hardware with locks and keys. Two stainless steel shelves are included. Drawers are stainless steel with plastic liners for easy cleaning. To be listed by National Sanitation Foundation.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal steel under-carriage 14 ga. 300 series stainless steel top to have not less than #4 finish. Plate mounted 4" diameter swivel casters with toe brakes to be provided.

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications.

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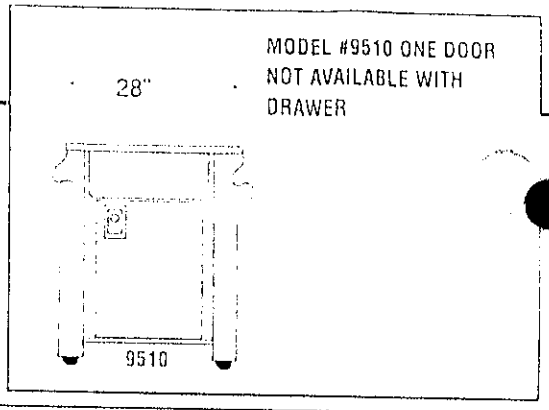
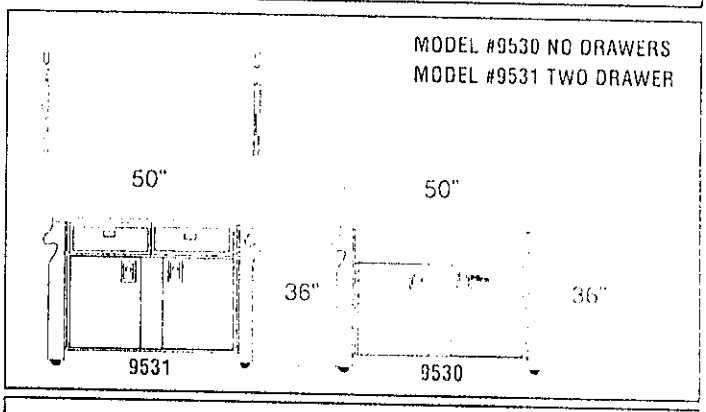
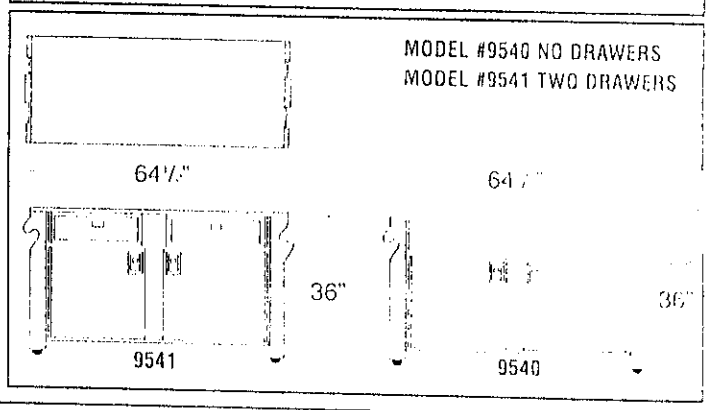
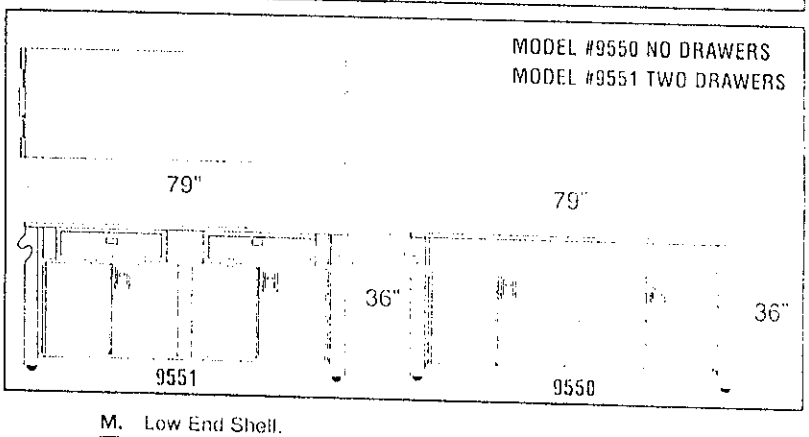
# Galley® Line

## Storage Module
## Model No's. 9510, 9530,9540, 9550, 9531, 9541, 9551




**ACCESSORIES:**

**A.** Decorator panels, specify catalog number and quantity. (See chart on front side).
- ☐ Catalog No. 8700 American Walnut, Quantity_____ Included.
- ☐ Catalog No. 8701 Teakwood, Quantity_____.
- ☐ Catalog No. 8702 Plain Custom Panel, Quantity_____.
- ☐ Catalog No. 8705A Light Oak, Quantity_____.

**B.** Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
- ☐ Catalog No. 8771, (*Short 28") 20 ⅞" width, used on 9310.
- ☐ Catalog No. 8772, 28" width, used on 9310.
- ☐ Catalog No. 8773, (*Short 50") 42 ⅞" width, used on 9330.
- ☐ Catalog No. 8774, 50" width, used on 9330.
- ☐ Catalog No. 8775, (*Short 64 ½") 57 ⅞" width, used on 9340.
- ☐ Catalog No. 8776, 64 ½" width, used on 9340.1
- ☐ Catalog No. 8777, (*Short 79") 71 ⅞" width, used on 9350.
- ☐ Catalog No. 8778, 79" width, used on 9350.

*Note: A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

**C.** Food Protector with plastic shelf, breathguard and stainless steel upright supports. 14" high.
- ☐ Catalog No. 8780, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8791, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8781, 64 ½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8792, 64 ½" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8782, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8793, 79" width, used on 9350. Lighted. UL listed.

**D.** Double Deck Display Stand with two plastic shelves, breathguard and stainless steel upright supports. 18" high.
- ☐ Catalog No. 8785, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8788, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8786, 64 ½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8789, 64 ½" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8787, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8790, 79" width, used on 9350. Lighted. UL listed.

**E.** Folding Cutting Board. All plastic. Mounted flush on server's side. Not available on Model 9310.
- ☐ Catalog No. 8763, 50" width, used on 9330.
- ☐ Catalog No. 8764, 64 ½" width, used on 9340.
- ☐ Catalog No. 8765, 79" width, used on 9350.

**F.** "Matelfat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5⅞"W x 28"D x 36"H.
- ☐ Catalog No. 8761 Male Panel (Fits female end).
- ☐ Catalog No. 8762 Female Panel (Fits male end).

**G.** Heated Shelf.
- ☐ Catalog No. 8726, use with 50" unit.

**H.** Flat End Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring to wall.)
- ☐ Catalog No. 8731, Replaces female "matelock".
- ☐ Catalog No. 8732, Replaces male "matelock".

**I.** Urn Drain. Not on models with drawers.
- ☐ Catalog No. 8715, 18" long.
- ☐ Catalog No. 8716, 24" long.
- ☐ Catalog No. 8717, 30" long.
- ☐ Catalog No. 8718, 36" long.

Drain trough with drain hose and valve to be located on customer's side.

**J.** Merchandising Shelf.
- ☐ Catalog No. 8722, use with 50" width unit.
- ☐ Catalog No. 8713, use with 64 ½" width unit.
- ☐ Catalog No. 8714, use with 79" width unit.

**K.** Portable Breathguard.
- ☐ Catalog No. 8724.

**L.** Buffet Style Canopy.
- ☐ Catalog No. 8740, use with 50" unit. UL listed.
- ☐ Catalog No. 8741, use with 64 ½" unit. UL listed.
- ☐ Catalog No. 8742, use with 79" unit. UL listed

**M.** Low End Shelf.
- ☐ Catalog No. 8725 (Not for use with item L or M)

**N.** Buffet Style Canopy with Heat Lamps.
- ☐ Catalog No. 8743, use with 50" width unit. UL listed
- ☐ Catalog No. 8744, use with 64 ½" width unit. UL listed
- ☐ Catalog No. 8745, use with 79" width unit. UL listed

**O.** Electrical Outlets (Not UL listed).
- ☐ Catalog No. 8696, Tombstone, Top Mounted, Duplex, 125V, 15 AMP
- ☐ Catalog No. 8697, Operator Side, Under Top Skirt, Duplex, 120V, 16
- ☐ Catalog No. 8698, Operator Side, Under Top Skirt, Single, 120V, 15 A
- ☐ Catalog No. 8699, Operator Side, Under Top Skirt, Single, 120V, 15 AMP

Note: #8696 and #8697 are part of the module wiring. #8698 and #8699 have separate cord set.

Specifications subject to change without notice.

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28" - Short 20 7/8" | | Full 50" - Short 42 7/8" | | Full 64.5" - Short 57 3/8" | | Full 79" - Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| *New!* 45° Corner Inside | 8770A | 12 | | | | | | |
| *New!* 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | ~~8508~~ | | ~~8508~~ | | ~~8508~~ | | ~~8508~~ | |

Trayslides (8774 Shown)

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| ~~**White Plastic, Folding**~~ 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28" - Short 20 7/8" | | Full 50" - Short 45 7/8" | | Full 64.5" - Short 60 3/8" | | Full 79" - Short 74 7/8" | |
| *New!* Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| *New!* **Stainless Plate Rest:** | | | | | | | | |
| *New!* Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |
| Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843. | | | | | | | | |
| *New!* **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| *New!* **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable** (NSF), Wood 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

#8998

Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |

8733 8734 8735 8736

Closure and Access Panel (8734 Shown)

| Description | 28" Model | Lbs. | 50" Model | Lbs. | 64.5" Model No. | Lbs. | 79" Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. Note: #9230, #9231, & #9630 cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |

Undershelf (2 Shown)
Interior Stainless End Liners (Not Shown)



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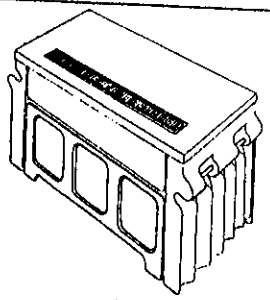
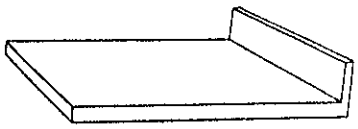
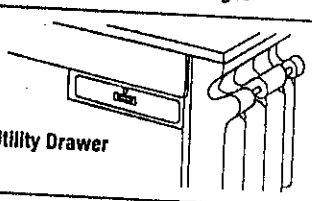
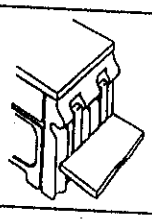
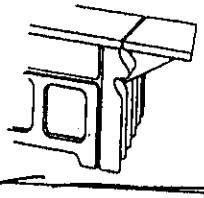
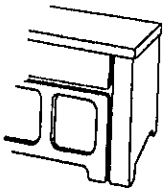
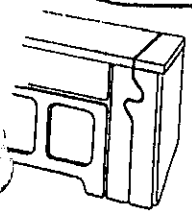
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

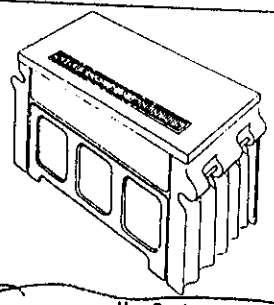
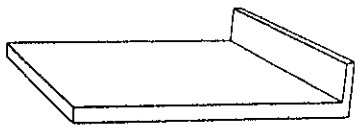
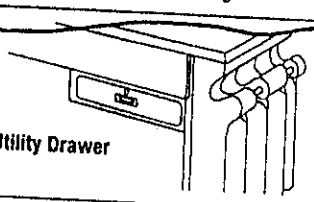
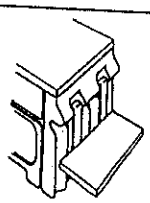
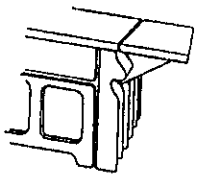
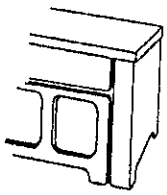
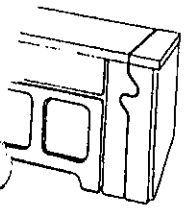
| | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Urn Drains | **Urn Drain Trough, Splash Guard, Drain Hose and Shut Off Valve** | | | | | | | | |
| | 18" Urn Drain | 8715 | 10 | 8715 | 10 | 8715 | 10 | 8715 | 10 |
| | 24" Urn Drain | | | 8716 | 15 | 8716 | 15 | 8716 | 15 |
| | 30" Urn Drain | | | 8717 | 20 | 8717 | 20 | 8717 | 20 |
| | 36" Urn Drain | | | 8718 | 25 | 8718 | 25 | 8718 | 25 |
| | | Specify Location in Utility Module Top - to the Right, Left or Center of Customer. Bracing is included for heavy loads. | | | | | | | |
|  *New!* Backsplash and Riser, Mirror Finish Edges, Marine Edges | **Backsplash and Riser, 4" High, #4 Finish S/S** | 8660 | 10 | 8661 | 15 | 8662 | 20 | 8663 | 25 |
| | Corner Backsplash | 8689 | 7 | | | | | | |
| | **Tri-Directional Backsplash** | 8504 | 7 | | | | | | |
| | *New!* **Backsplash For 9428** | 8504 | 10 | | | | | | |
| | *New!* **Marine Edges** | 8680 | 0 | 8681 | 0 | 8682 | 0 | 8683 | 0 |
| | **Mirror Finish Edges** | 8944 | 0 | 8945 | 0 | 8946 | 0 | 8947 | 0 |
|  Utility Drawer | **Large Stainless Steel Utility Drawer** with Removable Liner and Lock and Key Cannot Be used on Refrigerated Modules | Not Available | | 8760 | 44 | 8760 | 44 | 8760 | 44 |
| | | Specify Location– Right, Left or Center of Server. | | | | | | | |
| | Dimensions: Inside - 24.25"W x 23"D x 5"H, Outside 25.5"W x 23"D x 5.5"H. | | | | | | | | |
|  Low End Shelf - Removable 16" x 28" | **Low End Shelf -** 16" x 28" - 15" Above Floor Level For Trays or Plates | 8725 | 25 | 8725 | 75 | 8725 | 75 | 8725 | 75 |
|  Extension Shelf- Removable 16" x 28" | **Extension Shelf -** 16" x 28" - Flush to top For Extra Display, Cashier Counter, or Trays and Plates | 8754 | 17 | 8754 | 67 | 8754 | 67 | 8754 | 67 |
|  Permanent Flat Ends - #8731 Shown | **Permanent Flat End** | | | | | | | | |
| | Flat End - Right Replaces Male End | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge |
| | Flat End - Left Replaces Female End | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge |
| | **Elementary School Height Modification** | 8511 | | 8511 | | 8511 | | 8511 | |
| | | Pewter Tan #8731 and #8732, Dove White #8731W and 8732W, Black Pearl #8731A and #8732A | | | | | | | |
|  Removable Matelock Flat End Female #8762 Shown | **Removable Matelock Flat End with two adjustable legs.** | | | | | | | | |
| | Flat and Male Ends | 8761 | 53 | 8761 | 53 | 8761 | 53 | 8761 | 53 |
| | Flat and Female Ends | 8762 | 53 | 8762 | 53 | 8762 | 53 | 8762 | 53 |
| Adds 5 3/8" to length of module | | Order a male end #8761 to fit on the female end of a module. Order a female end #8762 to fit on the male end of a module. Pewter Tan: #8761 and #8762; Dove White: #8761W and #8762W; Black Pearl: #8761A and #8762A | | | | | | | |

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

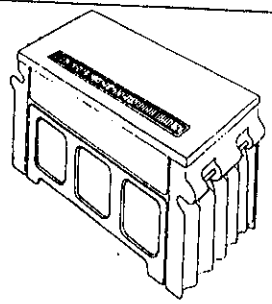
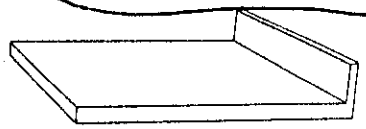
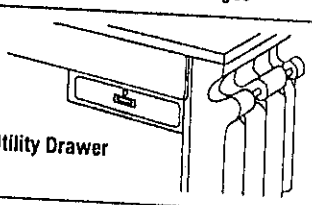
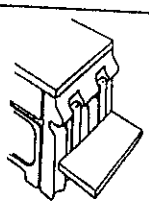
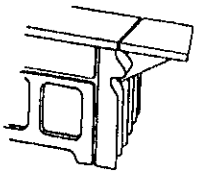
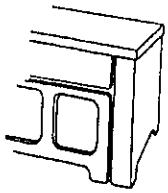
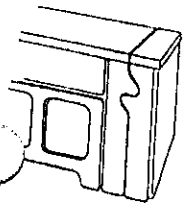
## Accessories

| | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Urn Drains | **Urn Drain Trough, Splash Guard, Drain Hose and Shut Off Valve** | | | | | | | | |
| | 18" Urn Drain | 8715 | 10 | 8715 | 10 | 8715 | 10 | 8715 | 10 |
| | 24" Urn Drain | | | 8716 | 15 | 8716 | 15 | 8716 | 15 |
| | 30" Urn Drain | | | 8717 | 20 | 8717 | 20 | 8717 | 20 |
| | 36" Urn Drain | | | 8718 | 25 | 8718 | 25 | 8718 | 25 |
| | | Specify Location in Utility Module Top - to the Right, Left or Center of Customer. Bracing is included for heavy loads. | | | | | | | |
|  Backsplash and Riser | *New!* **Backsplash and Riser,** 4" High, #4 Finish S/S | 8660 | 10 | 8661 | 15 | 8662 | 20 | 8663 | 25 |
| Mirror Finish Edges, Marine Edges | Corner Backsplash | 8689 | 7 | | | | | | |
| | **Tri-Directional Backsplash** | 8504 | 7 | | | | | | |
| | *New!* **Backsplash For 9428** | 8504 | 10 | | | | | | |
| | *New!* **Marine Edges** | 8680 | 0 | 8681 | 0 | 8682 | 0 | 8683 | 0 |
| | **Mirror Finish Edges** | 8944 | 0 | 8945 | 0 | 8946 | 0 | 8947 | 0 |
|  Utility Drawer | **Large Stainless Steel Utility Drawer** with Removable Liner and Lock and Key Cannot Be used on Refrigerated Modules | Not Available | | 8760 | 44 | 8760 | 44 | 8760 | 44 |
| | Specify Location– Right, Left or Center of Server. Dimensions: Inside - 24.25"W x 23"D x 5"H, Outside 25.5"W x 23"D x 5.5"H. | | | | | | | | |
|  Low End Shelf - Removable 16" x 28" | **Low End Shelf -** 16" x 28" - 15" Above Floor Level For Trays or Plates | 8725 | 25 | 8725 | 75 | 8725 | 75 | 8725 | 75 |
|  Extension Shelf- Removable 16" x 28" | **Extension Shelf -** 16" x 28" - Flush to top For Extra Display, Cashier Counter, or Trays and Plates | 8754 | 17 | 8754 | 67 | 8754 | 67 | 8754 | 67 |
|  Permanent Flat Ends - #8731 Shown | **Permanent Flat End** | | | | | | | | |
| | Flat End - Right Replaces Male End | 8731 0 | No Charge | 8731 0 | No Charge | 8731 0 | No Charge | 8731 0 | No Charge |
| | Flat End - Left Replaces Female End | 8732 0 | No Charge | 8732 0 | No Charge | 8732 0 | No Charge | 8732 0 | No Charge |
| | **Elementary School Height Modification** | 8511 | | 8511 | | 8511 | | 8511 | |
| | | Pewter Tan #8731 and #8732, Dove White #8731W and 8732W, Black Pearl #8731A and #8732A | | | | | | | |
|  Removable Matelock Flat End Female #8762 Shown | **Removable Matelock Flat End with two adjustable legs.** | | | | | | | | |
| | Flat and Male Ends | 8761 | 53 | 8761 | 53 | 8761 | 53 | 8761 | 53 |
| | Flat and Female Ends | 8762 | 53 | 8762 | 53 | 8762 | 53 | 8762 | 53 |
| Adds 5 3/8" to length of module | | Order a male end #8761 to fit on the female end of a module. Order a female end #8762 to fit on the male end of a module. Pewter Tan: #8761 and #8762; Dove White: #8761W and #8762W; Black Pearl: #8761A and #8762A | | | | | | | |

# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

| Accessories | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Urn Drains | Urn Drain Trough, Splash Guard, Drain Hose and Shut Off Valve | | | | | | | | |
| | ~~18" Urn Drain~~ | 8715 | 10 | 8715 | 10 | 8715 | 10 | 8715 | 10 |
| | ~~24" Urn Drain~~ | | | 8716 | 15 | 8716 | 15 | 8716 | 15 |
| | ~~30" Urn Drain~~ | | | 8717 | 20 | 8717 | 20 | 8717 | 20 |
| | 36" Urn Drain | | | 8718 | 25 | 8718 | 25 | 8718 | 25 |
| | Specify Location in Utility Module Top - to the Right, Left or Center of Customer. Bracing is Included for heavy loads. | | | | | | | | |
|  Backsplash and Riser | *New!* Backsplash and Riser, 4" High, #4 Finish S/S | 8660 | 10 | 8661 | 15 | 8662 | 20 | 8663 | 25 |
| | Corner Backsplash | 8689 | 7 | | | | | | |
| | Tri-Directional Backsplash | 8504 | 7 | | | | | | |
| Mirror Finish Edges, Marine Edges | *New!* Backsplash For 9428 | 8504 | 10 | | | | | | |
| | *New!* Marine Edges | 8680 | 0 | 8681 | 0 | 8682 | 0 | 8683 | 0 |
| | Mirror Finish Edges | 8944 | 0 | 8945 | 0 | 8946 | 0 | 8947 | 0 |
|  Utility Drawer | Large Stainless Steel Utility Drawer with Removable Liner and Lock and Key Cannot Be used on Refrigerated Modules | Not Available | | 8760 | 44 | 8760 | 44 | 8760 | 44 |
| | Specify Location-- Right, Left or Center of Server. Dimensions: Inside - 24.25"W x 23"D x 5"H, Outside 25.5"W x 23"D x 5.5"H. | | | | | | | | |
|  Low End Shelf - Removable 16" x 28" | Low End Shelf - 16" x 28" - 15" Above Floor Level For Trays or Plates | 8725 | 25 | 8725 | 75 | 8725 | 75 | 8725 | 75 |
|  Extension Shelf- Removable 16" x 28" | Extension Shelf - 16" x 28" - Flush to top For Extra Display, Cashier Counter, or Trays and Plates | 8754 | 17 | 8754 | 67 | 8754 | 67 | 8754 | 67 |
|  Permanent Flat Ends - #8731 Shown | Permanent Flat End | | | | | | | | |
| | Flat End - Right Replaces Male End | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge |
| | Flat End - Left Replaces Female End | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge |
| | Elementary School Height Modification | 8511 | | 8511 | | 8511 | | 8511 | |
| | Pewter Tan #8731 and #8732, Dove White #8731W and 8732W, Black Pearl #8731A and #8732A | | | | | | | | |
|  Removable Matelock Flat End Female #8762 Shown | Removable Matelock Flat End with two adjustable legs. Flat and Male Ends | 8761 | 53 | 8761 | 53 | 8761 | 53 | 8761 | 53 |
| | Flat and Female Ends | 8762 | 53 | 8762 | 53 | 8762 | 53 | 8762 | 53 |
| Adds 5 3/8" to length of module | Order a male end #8761 to fit on the female end of a module. Order a female end #8762 to fit on the male end of a module. Pewter Tan: #8761 and #8762; Dove White: #8761W and #8762W; Black Pearl: #8761A and #8762A | | | | | | | | |

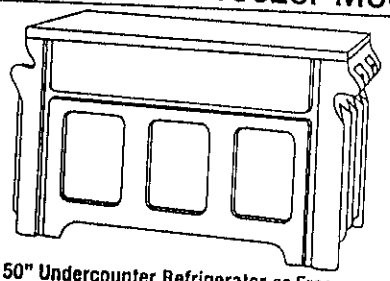
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

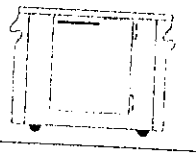
## Undercounter Refrigerator and Freezer Modules

| Model Number | Electrical | Description | Dimensions Width | Depth | Height | Freight Class | Shipping Weight Pounds |
|---|---|---|---|---|---|---|---|
| 9361 | 120V, 1 Ph. | Utility Counter & 1 door Refrigerator, 38°F | 50" | 28" | 36" | 92 1/2 | 475 |
| 9364 | 120V, 1 Ph. | Utility Counter & 1 door Freezer, -10°F | 50" | 28" | 36" | 92 1/2 | 475 |

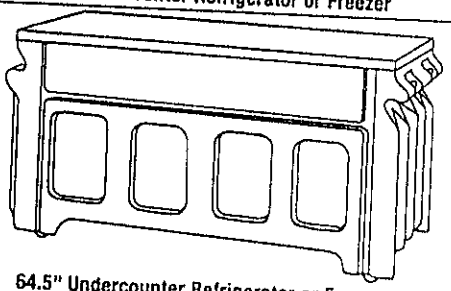


50" Undercounter Refrigerator or Freezer

All Sides Closed. 6.2 Cubic Feet with 2 Adjustable Shelves.
Optional Tray Slide (s): #8774.

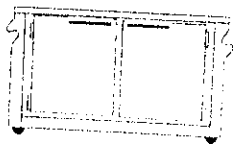


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9362 | 120V, 1 Ph. | Utility Counter & 2 door Refrigerator, 38°F | 64.5" | 28" | 36" | 92 1/2 | 550 |
| 9365 | 120V, 1 Ph. | Utility Counter & 2 door Freezer, -10°F | 64.5" | 28" | 36" | 92 1/2 | 550 |

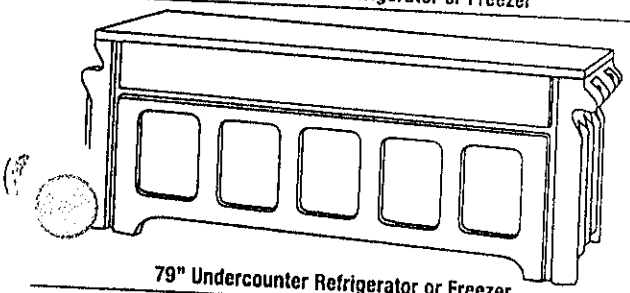


64.5" Undercounter Refrigerator or Freezer

All Sides Closed. 11.8 Cubic Feet with 2 Adjustable Shelves.
Optional Tray Slide (s): #8776.

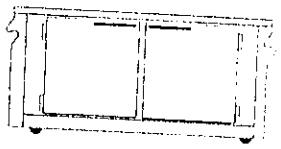


| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9363 | 120V, 1 Ph. | Utility Counter & 2 door Refrigerator, 38°F | 79" | 28" | 36" | 92 1/2 | 625 |
| 9366 | 120V, 1 Ph. | Utility Counter & 2 door Freezer, -10°F | 79" | 28" | 36" | 92 1/2 | 625 |

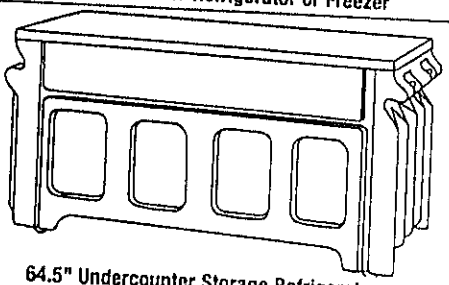


79" Undercounter Refrigerator or Freezer

All Sides Closed. 14.5 Cubic Feet with 2 Adjustable Shelves.
Optional Tray Slide (s): #8778.



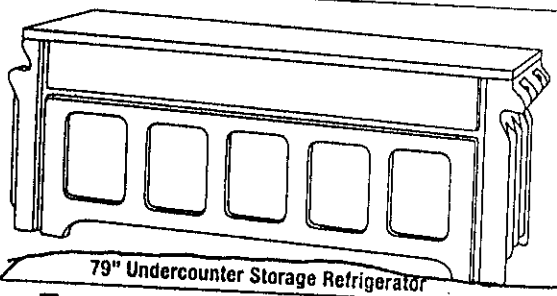
| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9246 | 120V, 1 Ph. | 38°F Refrigerator, 1 Door, with 10 Pan Slides. | 64.5" | 28" | 36" | 92 1/2 | 600 |



64.5" Undercounter Storage Refrigerator

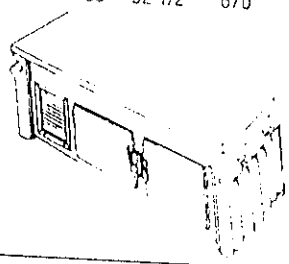
All Sides Closed. 8 Cubic Feet
Optional Tray Slide (s): #8776.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9256 | 120V, 1 Ph. | 38°F Refrigerator, 2 Doors, with 15 Pan Slides. | 79" | 28" | 36" | 92 1/2 | 670 |

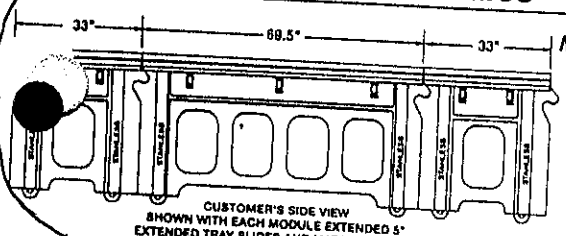


79" Undercounter Storage Refrigerator

All Sides Closed. 10 Cubic Feet
Optional Tray Slide (s): #8778.



## Extended Length Modules




CUSTOMER'S SIDE VIEW
SHOWN WITH EACH MODULE EXTENDED 5"
EXTENDED TRAY SLIDES AND MATELOCK ENDS

| Model Number | | |
|---|---|---|
| 8650 | *New!* | Extended Lengths 2" - 22" and or<br>Modified Heights to any Height 27" to 34"<br>Modified Counter Depths or Lengths up to 16" |

Modules and/or accessories are extended 2 inches to 22 inches per Galley drawings and specifications which may include two verticle stainless steel accent panels on each side of the module.

# Delfield

| | |
|---|---|
| PROJECT | |
| ITEM # | #85 |
| QUANTITY | DATE |
| APPROVAL | |

# F18SC

## 31.5" (80cm) Deep Self-Contained Refrigerated Salad Top Tables

### Short Form Specifications

**Exterior top** is constructed of one-piece 16-gauge stainless steel, with integral 2.12" (5.4cm) square nosing at the front, and 4.00" (10.2cm) high by 2" (5.1cm) deep backsplash at the rear. Top has an opening for use with 1/6 size pans. Pans and adapter bars supplied by others. Pans are recessed 3" (7.6cm), or 2" (5.1cm) and rest on adjustable pan supports. Pan opening has a 20-gauge stainless steel removable cover. Temperature in top opening to maintain 33°F (1°C) to 41°F (5°C), with pans recessed 3" (7.6cm), at 86°F ambient room temperature, meeting NSF7 requirements.

Unit has a stainless steel plate shelf 8.4" [21.3cm] above the doors.

**Exterior back** and bottom to be 24-gauge galvanized steel. Exterior ends are 18-gauge galvanized steel.

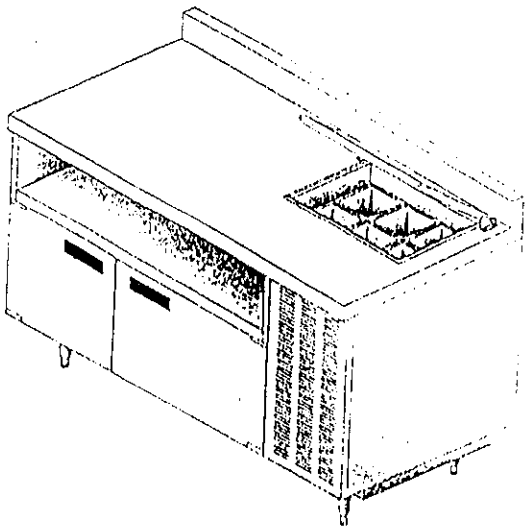
**Base interior** has a 22-gauge stainless steel back and bottom. Interior ends and door frames are thermoformed ABS plastic. Base is insulated with 1.5" (3.8cm) of high-density foamed-in-place polyurethane.

**Door(s)** have a 22-gauge stainless steel exterior front, with a thermoformed ABS plastic interior liner. Door(s) have a black recessed handle and a snap-in magnetic gasket which is easily replaceable.

**Base** has a machine compartment, standard on the right, with condensing unit, condensate evaporator and an electrical junction box installed. Machine compartment has a louver for access to condensing unit. Blower coil(s) are mounted behind the door mullions and refrigerate the cabinet. HFC-404A refrigerant and maintains 36°F (2°C) to 40°F (4°C) interior cabinet temperature in the base.

Unit is mounted on 6.13" (15.6cm) high adjustable stainless steel legs.

**Electrical connections** are 115 volts, 60 Hertz, single phase. Unit has an 8' (2.4m) long cord and plug.



**Model F18SC60A**

### Optional Accessories & Modifications

| | |
|---|---|
| 906A | Stainless steel end |
| 505H | Stainless steel back |
| 505F | Laminate facing (full front) |
| 906E | Laminate end |
| 905A | Laminate back |
| 1030A | Cutting board (Sanalite or composite) |
| 107F | Tray rack |
| 102 | Drawers<br>A-(2) 19" in lieu of one door<br>B-(2) 27" in lieu of one door<br>C-(2) 32" in lieu of one door |
| 108 | Locks |
| 120F | Cold pan drain |
| 213 | *220V/50 cycle |
| 1027A | Casters |

*Inclusion of this option will alter the electrical specifications of the unit

404A REFRIGERANT

Delfield's MARK7 modular equipment

The Delfield Company, P.O. Box 470, Mt Pleasant, MI 48804-0470, U.S.A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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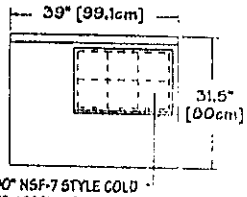
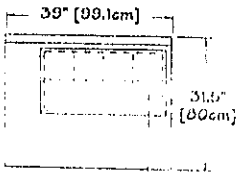
# 31.5" (80cm) Deep Self-Contained Refrigerated Salad Top Tables



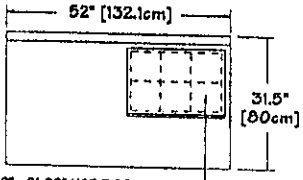

13.82" x 21.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (6) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC39A



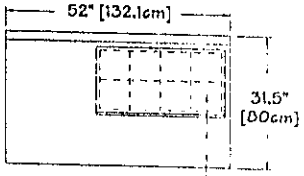

13.82" x 28.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (8) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC39B



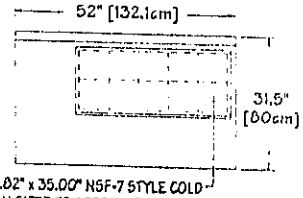

13.82" x 21.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (6) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC52A



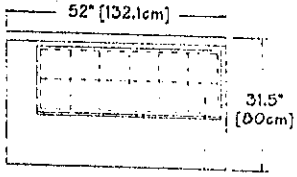

13.82" x 28.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (8) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC52B



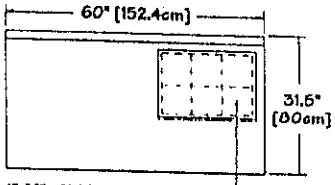

13.82" x 35.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (10) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC52C



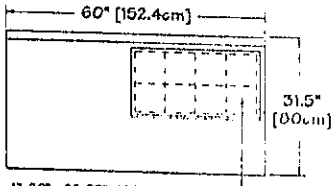

13.82" x 42.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (12) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC52D



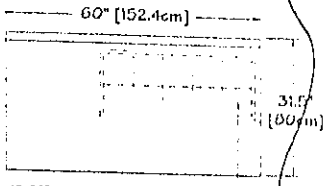

13.82" x 21.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (6) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC60A



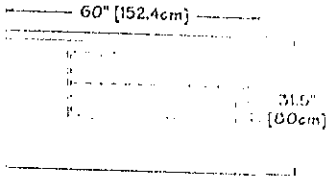

13.82" x 28.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (8) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC60B




13.82" x 35.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (10) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC60C




13.82" x 42.00" NSF-7 STYLE COLD PAN SIZED TO ACCOMMODATE (12) 1/6 SIZE PANS 6" DP. WITH HINGED REMOVABLE COVER. (PANS AND ADAPTER BARS BY OTHERS)

PLAN VIEW
18SC60D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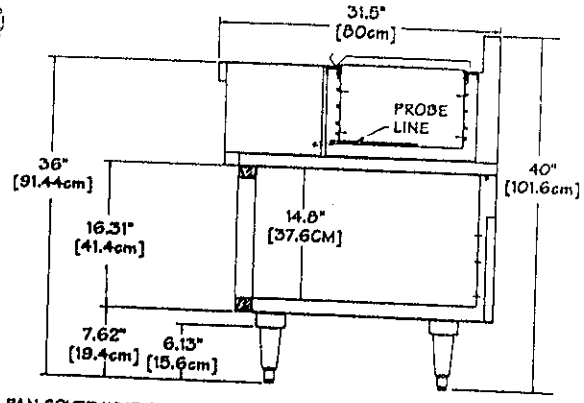
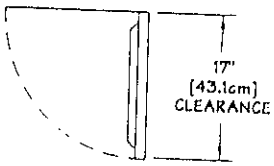
# 31.5" (80cm) Deep Self-Contained Refrigerated Salad Top Tables

#83

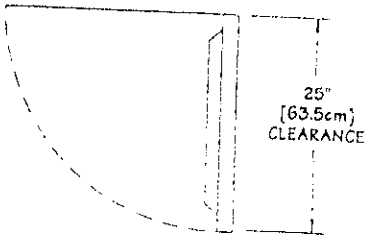



PAN COVER WHEN OPEN EXTENDS TO A HEIGHT OF 12" (30.5cm)

END VIEW
ALL MODELS

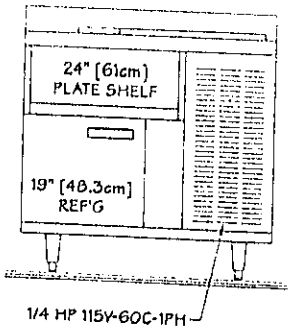



19" [48.3cm]
DOOR

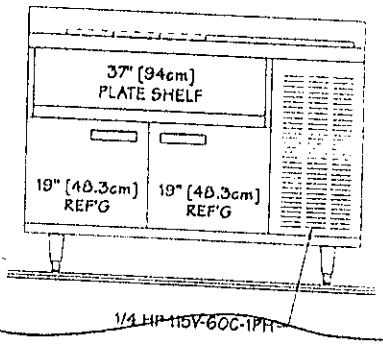



27" [68.6cm]
DOOR

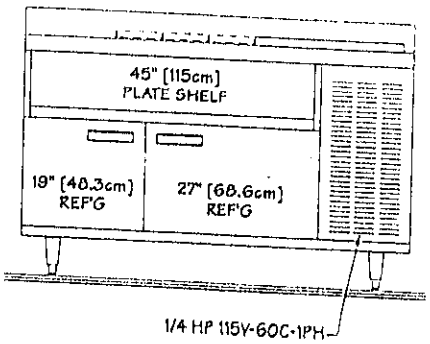
ELEVATION VIEW
F18SC39A,
F18SC39B




ELEVATION VIEW
F18SC52A,
F18SC52B,
F18SC52C,
F18SC52D




ELEVATION VIEW
~~F18SC60A,~~
~~F18SC60B,~~
~~F18SC60C,~~
F18SC60D

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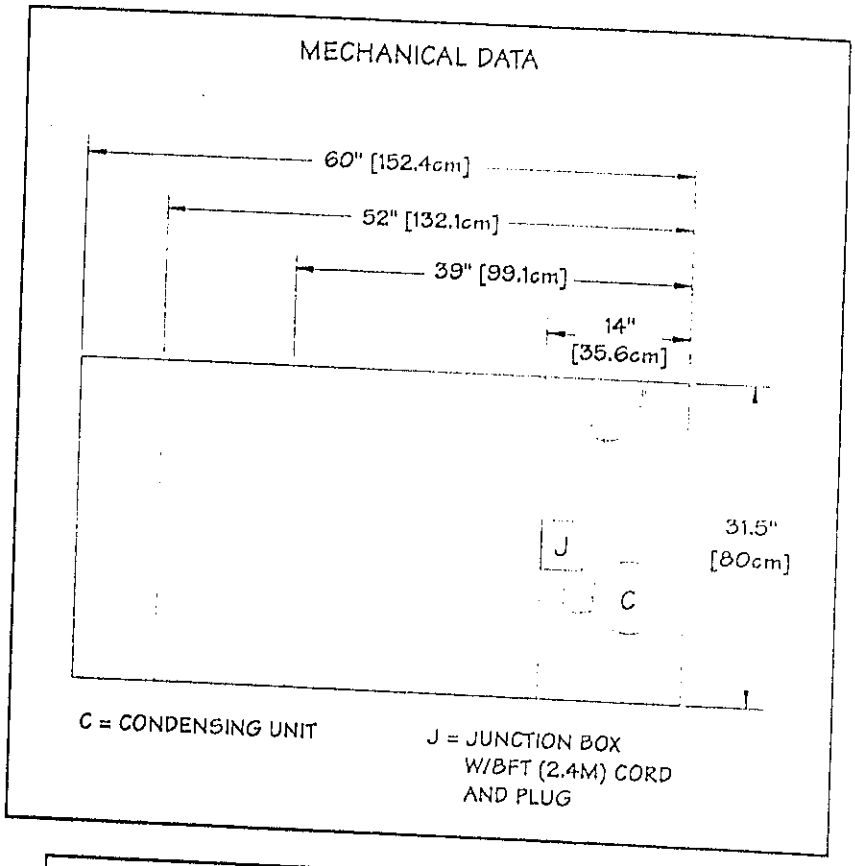


NOTE; UNOBSTRUCTED AIRFLOW MUST BE MAINTAINED TO INSURE UNIT PERFORMANCE AND MAINTAIN WARRANTY.

## Mechanical Data-Standard Unit

| MODEL NUMBER | NUMBER OF DOORS | # OF PANS | STORAGE CU. FT. | H.P. | VOLTS/HERTZ/ PHASE | AMPS | NEMA | SHIP WEIGHT LBS / KG | BTU DESIGN BASE/RAIL | BTU SYSTEM CAP. BASE/RAIL |
|---|---|---|---|---|---|---|---|---|---|---|
| F18SC39A | (1) 19" | 6 | 4.11 | 1/4 | 115/60/1 | 10.0 | 5-15P | 400/181 | 280/265 | 1903/745 |
| F18SC39B | (1) 19" | 8 | 4.11 | 1/4 | 115/60/1 | 10.0 | 5-15P | 390/177 | 280/353 | 1903/867 |
| F18SC52A | (2) 19" | 6 | 6.94 | 1/4 | 115/60/1 | 10.0 | 5-15P | 460/208 | 444/265 | 1903/745 |
| F18SC52B | (2) 19" | 8 | 6.94 | 1/4 | 115/60/1 | 10.0 | 5-15P | 450/204 | 444/353 | 1903/867 |
| F18SC52C | (2) 19" | 10 | 6.94 | 1/4 | 115/60/1 | 10.0 | 5-15P | 440/199 | 444/441 | 1903/971 |
| F18SC52D | (2) 19" | 12 | 6.94 | 1/4 | 115/60/1 | 10.0 | 5-15P | 480/195 | 444/529 | 1903/1061 |
| F18SC60A | (2) 19" & 27" | 6 | 8.69 | 1/4 | 115/60/1 | 10.0 | 5-15P | 500/227 | 515/265 | 2314/667 |
| F18SC60B | (2) 19" & 27" | 8 | 8.69 | 1/4 | 115/60/1 | 10.0 | 5-15P | 490/222 | 515/353 | 2314/798 |
| F18SC60C | (2) 19" & 27" | 10 | 8.69 | 1/4 | 115/60/1 | 10.0 | 5-15P | 480/217 | 515/441 | 2314/916 |
| F18SC60D | (2) 19" & 27" | 12 | 8.69 | 1/4 | 115/60/1 | 10.0 | 5-15P | 470/213 | 515/529 | 2314/1023 |

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Delfield

Project _____

Item Number #86

Quantity _____ Date _____

Approval _____

# SRR-S/SFR-S

## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units mounted on 4" (10.16) casters.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Glass doors shall be constructed with extruded aluminum frames. Refrigerator shall utilize insulated double-pane construction. Freezers shall utilize argon-insulated double-pane, low E construction. Glass doors shall be provided with self-closing, cam-lift style hinges, and shall be easily removable without the use of tools. Glass door cabinets shall be provided with high-output fluorescent lights.

Electronic controls shall be located behind a removable shroud facing. Main power switch shall be located on the junction box on top of the unit.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

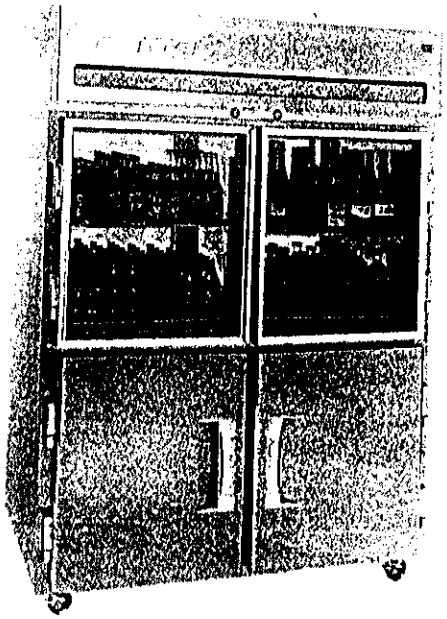
Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain –10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.



MODEL SRR1-GHSH

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray Slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 6" (15.24 cm) diameter legs (adds 2" to over height of unit)

c UL NSF UL 404A

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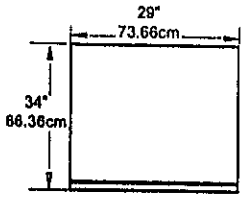
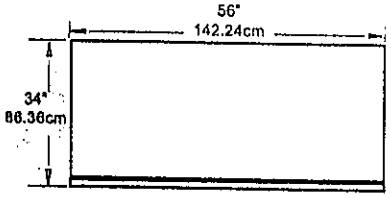
# SRR-S/SFR-S

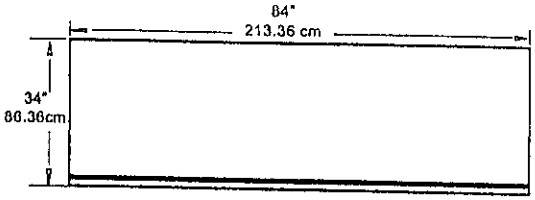
## Supremacy Series™ Solid Door Reach-In Refrigerators and Freezers



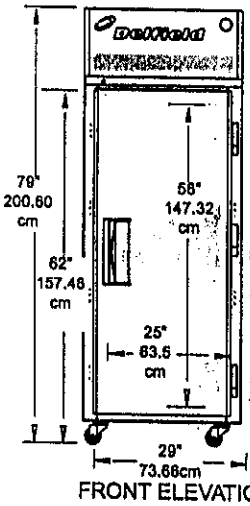

PLAN VIEW



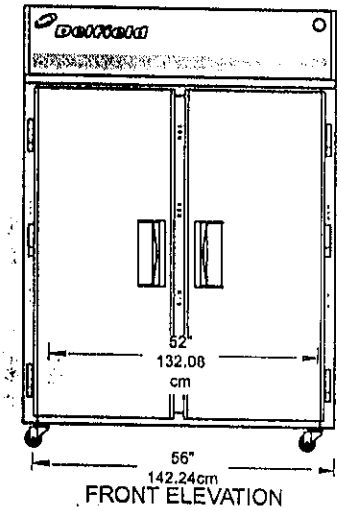

PLAN VIEW



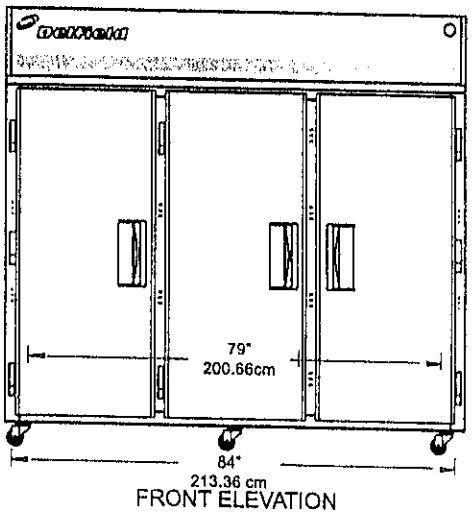

PLAN VIEW



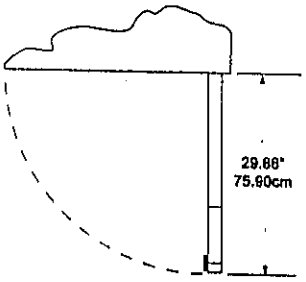

FRONT ELEVATION



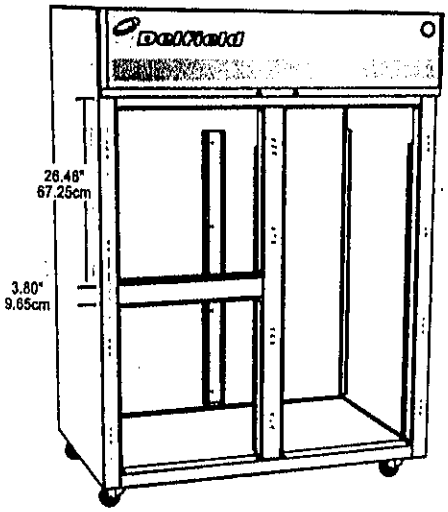

FRONT ELEVATION

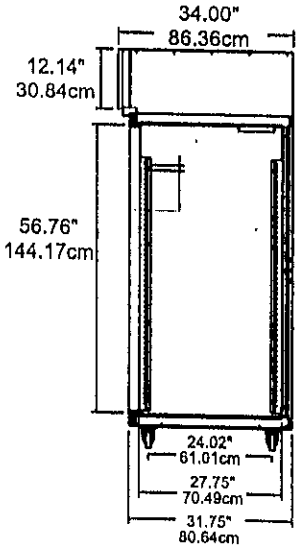



FRONT ELEVATION




DOOR CLEARANCE DETAIL




## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| **REFRIGERATORS** | | | | | | | | | | |
| **SRR1-S** | 115 | 8.5 | 24.96 | 12.87 | 1 | 1/4 | 758 | 2015 | 592 | 5-15P |
| **SRR2-S** | 115 | 10.8 | 51.92 | 27.5 | 2 | 1/3 | 1374 | 2943 | 856 | 5-15P |
| **SRR3-S** | 115 | 12.3 | 78.89 | 40.5 | 3 | 1/2 | 1971 | 3894 | 1088 | 5-20P |
| **FREEZERS** | | | | | | | | | | |
| **SFR1-S** | 115 | 11.1 | 24.96 | 12.87 | 3 | 1/2 | 1239 | 1629 | 650 | 5-20P |
| **SFR2-S** | 115 | 14.9 | 51.92 | 27.5 | 6 | 3/4 | 2247 | 3326 | 946 | 5-20P |
| **SFR3-S** | 115 | 16.0 | 78.89 | 40.5 | 9 | 1 | 3222 | 4253 | 1208 | 14-20P |

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DSSR 09/01

# Ranserve SCA Series Cold Pan Units

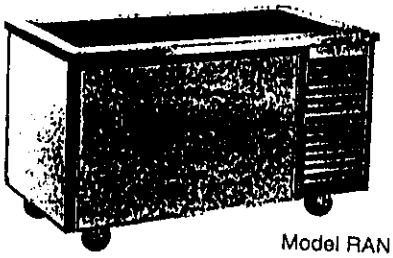
RanServe By Randell

PROJECT #89

ITEM # QTY.

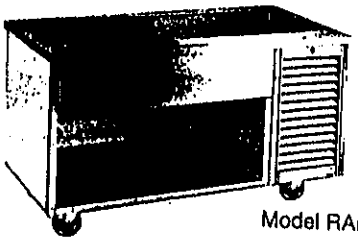
DATE

## Self-Contained Cold Pan Units



Model RAN SCA-3

Portable, stainless steel self-contained cold pan serving station. 1" drain provided. Available with enclosed base or open storage. Foamed in place (CFC free) insulation. Interchangeable stainless steel, or laminate body panels, snap together locking device designed to work with all other Ranserve equipment. (4) swivel casters provided. R-404a wrapped refrigeration system is "CFC free", and meets NSF standard #7.



Model RAN SCA-3S

## Models ☐ SCA Series ☑ SCA "S" Series

### STANDARD FEATURES:

- Stainless steel self-contained cold pan with expansion valve, temperature control and one piece interior.
- HFC-404a refrigerant, "CFC free".
- Foamed in place (CFC free) high density polyurethane insulation.
- Interchangeable body panels.
- "Bayonet" locking system to align and hold unit together with other Ranserve units if needed.
- 1" drain, drain nipple and ball valve.
- Swivel casters - (2) locking.
- Meets NSF standard #7.

MODELS
RAN SCA-3
RAN SCA-4
RAN SCA-5

RAN SCA-3S
RAN SCA-4S
RAN SCA-5S

### SPECIFICATIONS:

**UNIT TOP:** Top to be one piece of die-formed 16 gauge stainless steel with 1 1/2", 90° nosing on all sides. Unit fitted with 9 1/2" deep self-contained display cold pan. Interior of pan to be one piece, continuously welded construction of 18 gauge stainless steel. Interior fitted with 1" drain at one end. Drain nipple supplied with ball valve and lever extension to cabinet exterior on enclosed base units - drain lines run to accessible area.

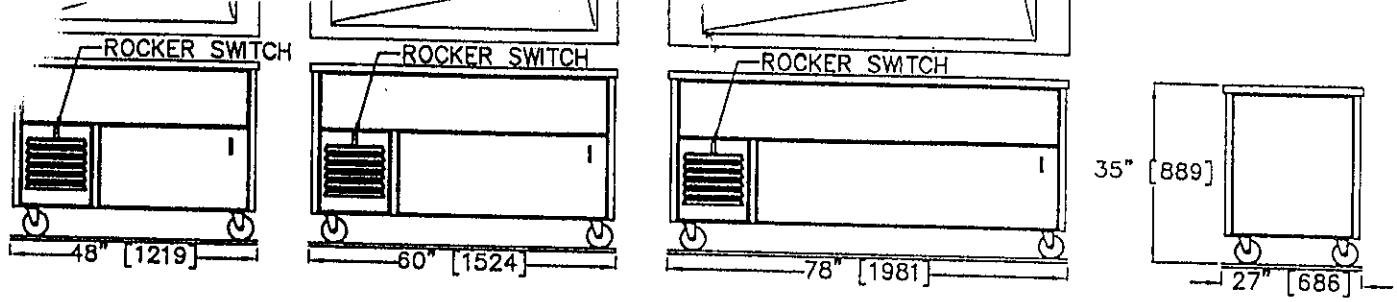
**UNIT BODY:** SCA Series (Buffet style with ***enclosed base***); One end of unit to be fitted with female, spring loaded openings and the other end to be fitted with male " bayonet" fittings to align, and hold units in place when two or more modular units are joined. Body frame to be all welded construction of steel with exposed corners to be 1 1/2" stainless steel. All corners welded and polished. Body ends and panels to be plastic laminate with galvanized steel backing (specify laminate color). Body ends and panels to be removable to allow the changing of colors. Cold pan wrapped with refrigeration lines and insulated with high density (CFC free) polyurethane, foamed in place. Unit to be equipped with 4 swivel casters, (2) locking, that are recessed inside of toe area.

**REFRIGERATION:** CFC free, R-134a refrigeration system to be wrapped refrigeration construction. Expansion valve, and thermostatic control for operator adjustability mounted in compressor housing. 9' cordset (NEMA 5-15P) supplied for 120V operation.

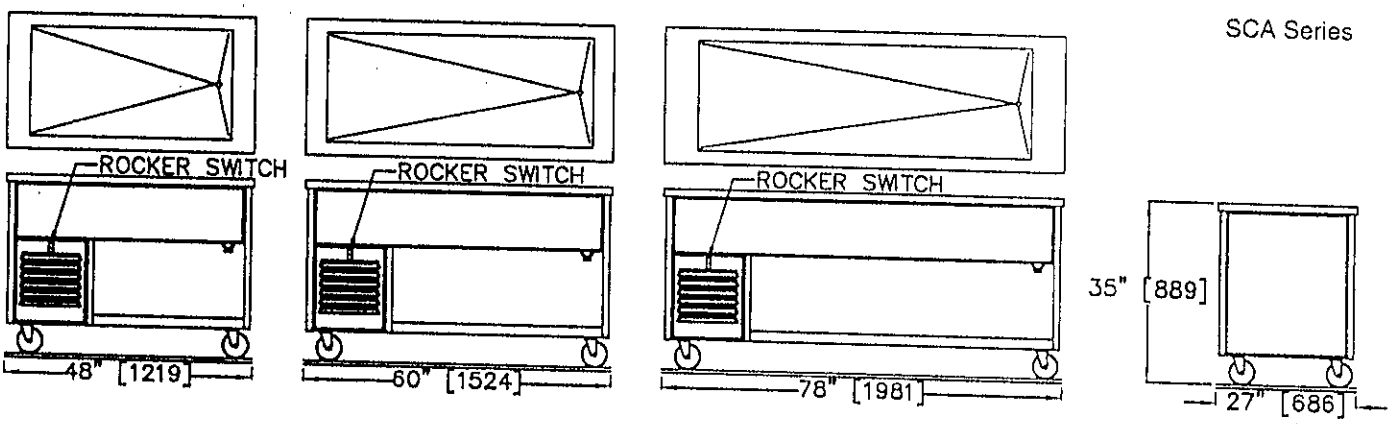
**"S" series** (Cafeteria style with ***open base***) Same spec as SCA series only "S" series units to have partial stainless steel panel on one side with undershelf. Undershelf to be 22 gauge stainless steel with integrally welded steel under-bracing. Self-contained display pan to have ball valve, accessible thru storage area.

**Randell Manufacturing, Inc.**
520 S. Coldwater Rd. Weidman, MI 48893
Phone 1-800-621-8560 Fax 1-800-634-5369

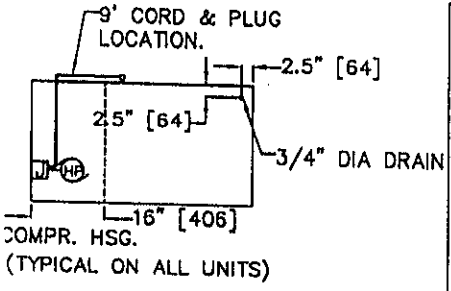
For the most current specifications, visit our WebSite. www.randell.com




SCA Series




SCA "S" Series




LEGEND FOR RAN SCA SERIES

AFF = ABOVE FIXED FLOOR

J J-BOX = 6" AFF

HP COMPRESSOR

3/4" DIA COPPER DRAIN LINE EXTENDS TO 1" BELOW BOTTOM OF UNITS

| Model | L | D | H | 12" x 20" Pan Capacity | Coldpan Interior Dimensions | HP | Volts | Amps | NEMA | Ship Wt. |
|---|---|---|---|---|---|---|---|---|---|---|
| RAN SCA-3 | 48" | 27" | 35" | 3 | 39 1/8" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 175 |
| RAN SCA-4 | 60" | 27" | 35" | 4 | 52 1/16" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 215 |
| RAN SCA-5 | 78" | 27" | 35" | 5 | 64 15/16" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 260 |
| RAN SCA-3S | 48" | 27" | 35" | 3 | 39 1/8" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 175 |
| RAN SCA-4S | 60" | 27" | 35" | 4 | 52 1/16" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 215 |
| RAN SCA-5S | 78" | 27" | 35" | 5 | 64 15/16" x 21 7/8" x 8 3/4" | 1/3 | 115/60/1 | 7 | 5-15P | 260 |

Our Product Line Is On

The KCL CADalog

AutoCAD™ R12-2000
AutoCAD™ Lt

**Randell Manufacturing, Inc.**

ue to a continuous program of product improvement, Randell reserves the right to make changes in design and specifications without prior notice

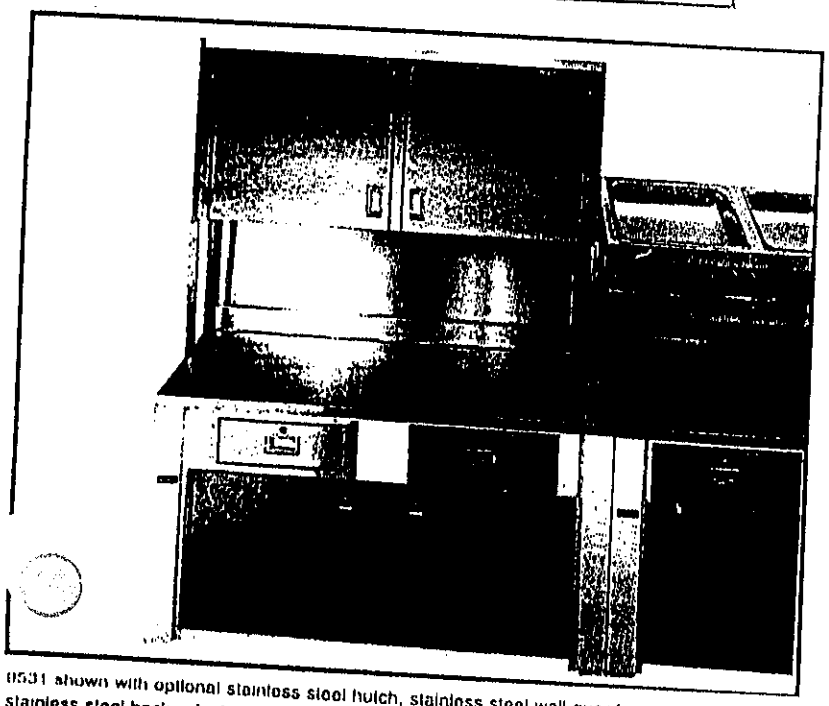
# Galley® Line

## Sanitary, Heavy Duty Storage Modules

Item No. # 90

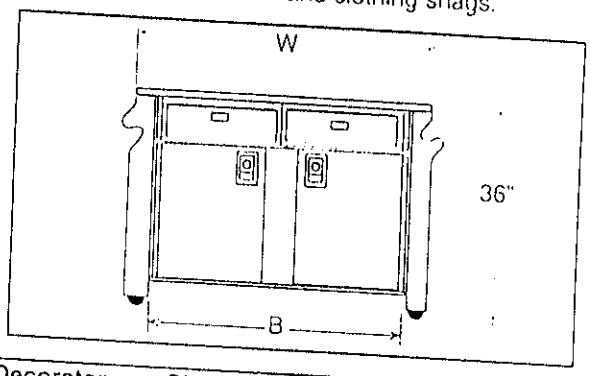
Model No. 9510
Model No. 9530
Model No. 9531
Model No. 9540
Model No. 9541
Model No. 9550
Model No. 9551

A1A11420



9531 shown with optional stainless steel hutch, stainless steel wall guard, stainless steel back splash, and flat ends.

- Aesthetic design, three neutral colors, dove white, pewter tan, or black pearl blend in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.
- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.




NSF

| Cat. No. | Module Size W | D | H | Dim B | Shpg. Wt. Lbs. | Quantity of Decorator Panels Required | Shelves | Doors | Drawers |
|---|---|---|---|---|---|---|---|---|---|
| 9510 | 28" | 28" | 36" | 17" | 200 | 1 | 2 | 1 | 0 |
| 9530 | 50" | 28" | 36" | 39" | 250 | 3 | 2 | 2 | 0 |
| 9531 | 50" | 28" | 36" | 39" | 250 | 3 | 2 | 2 | 2 |
| 9540 | 64 1/2" | 28" | 36" | 53 1/2" | 300 | 4 | 2 | 2 | 0 |
| 9541 | 64 1/2" | 28" | 36" | 53 1/2" | 300 | 4 | 2 | 2 | 2 |
| 9550 | 79" | 28" | 36" | 68" | 350 | 5 | 2 | 2 | 0 |
| 9551 | 79" | 28" | 36" | 68" | 350 | 5 | 2 | 2 | 2 |

To be **Galley® Line** Storage Module_____ with accessories as specified.

**GENERAL:** Unit to be self-contained, mobile storage module for room temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-[illegible]g and aligning end panels allow modules to be interconnect-[illegible]ve recessed pouch handles at each end. Removable side p[illegible]n one side to be recessed to accept decorator panels. Stainless steel door(s) have recessed hardware with locks and keys. Two stainless steel shelves are included. Drawers are stainless steel with plastic liners for easy cleaning. To be listed by National Sanitation Foundation.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal steel under-carriage 14 ga. 300 series stainless steel top to have not less than #4 finish. Plate mounted 4" diameter swivel casters with toe brakes to be provided.

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications.

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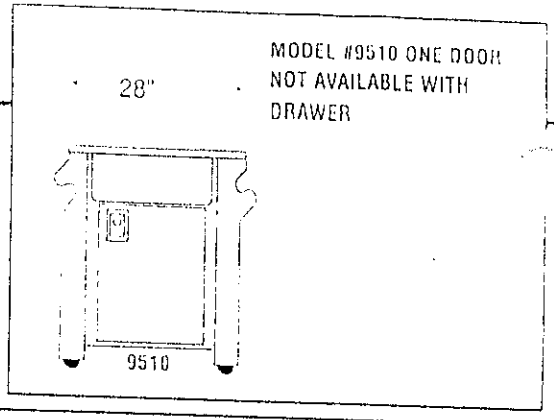
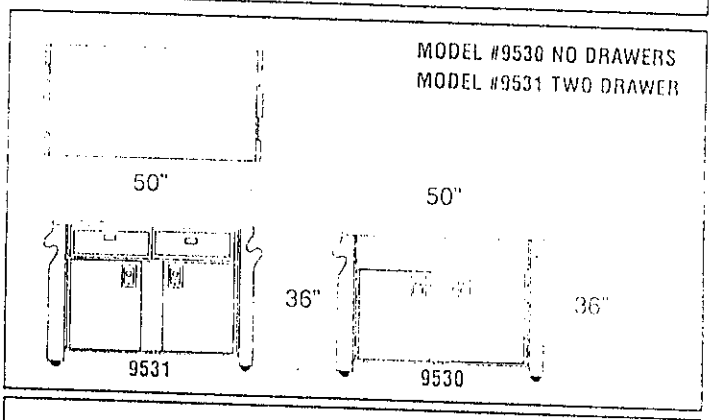
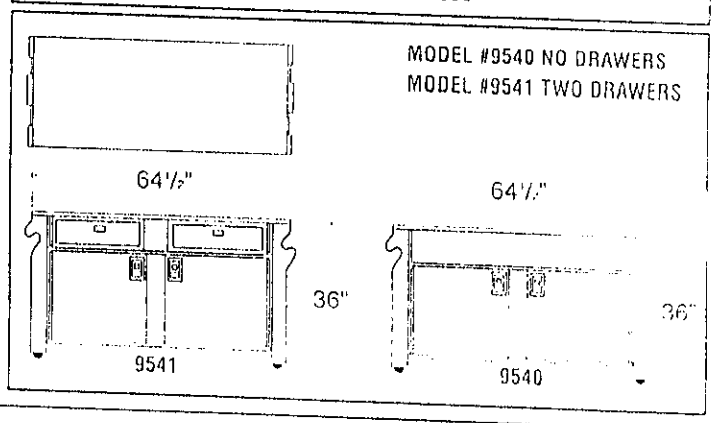
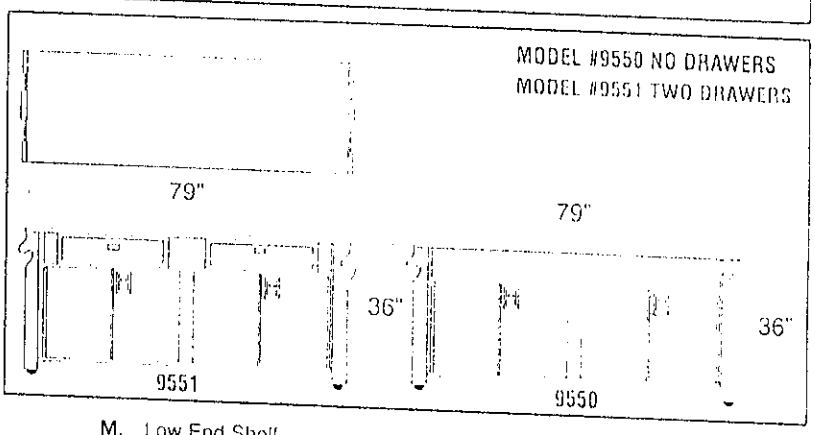
# Galley® Line

## Storage Module
## Model No's. 9510, 9530,9540, 9550, 9531, 9541, 9551




ACCESSORIES:

A. Decorator panels, specify catalog number and quantity. (See chart on front side).
- ☐ Catalog No. 8700 American Walnut, Quantity_____ Included.
- ☐ Catalog No. 8701 Teakwood, Quantity_____.
- ☐ Catalog No. 8702 Plain Custom Panel, Quantity_____.
- ☐ Catalog No. 8705A Light Oak, Quantity_____.

B. Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
- ☐ Catalog No. 8771, (*Short 28") 20⅞" width, used on 9310.
- ☐ Catalog No. 8772, 28" width, used on 9310.
- ☐ Catalog No. 8773, (*Short 50") 42⅞" width, used on 9330.
- ☐ Catalog No. 8774, 50" width, used on 9330.
- ☐ Catalog No. 8775, (*Short 64½") 57⅞" width, used on 9340.
- ☐ Catalog No. 8776, 64½" width, used on 9340.1
- ☐ Catalog No. 8777, (*Short 79") 71⅞" width, used on 9350.
- ☐ Catalog No. 8778, 79" width, used on 9350.

*Note: A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

C. Food Protector with plastic shell, breathguard and stainless steel upright supports. 14" high.
- ☐ Catalog No. 8780, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8791, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8781, 64½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8792, 64½" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8782, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8793, 79" width, used on 9350. Lighted. UL listed.

D. Double Deck Display Stand with two plastic shelves, breathguard and stainless steel upright supports. 18" high.
- ☐ Catalog No. 8785, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8788, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8786, 64½" width, used on 9340. Unlighted.
- ☐ Catalog No. 8789, 64½" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8787, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8790, 79" width, used on 9350. Lighted. UL listed.

E. Folding Cutting Board. All plastic. Mounted flush on server's side. Not available on Model 9310.
- ☐ Catalog No. 8763, 50" width, used on 9330.
- ☐ Catalog No. 8764, 64½" width, used on 9340.
- ☐ Catalog No. 8765, 79" width, used on 9350.

F. "Mateflat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5⅞"W x 28"D x 36"H.
- ☐ Catalog No. 8761 Male Panel (Fits female end).
- ☐ Catalog No. 8762 Female Panel (Fits male end).

G. Heated Shelf.
- ☐ Catalog No. 8726, use with 50" unit.

H. Flat End Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring to wall.)
- ☐ Catalog No. 8731, Replaces female "matelock".
- ☐ Catalog No. 8732, Replaces male "matelock".

I. Urn Drain. Not on models with drawers.
- ☐ Catalog No. 8715, 18" long.
- ☐ Catalog No. 8716, 24" long.
- ☐ Catalog No. 8717, 30" long.
- ☐ Catalog No. 8718, 36" long.

Drain trough with drain hose and valve to be located on customer's side.

J. Merchandising Shelf.
- ☐ Catalog No. 8722, use with 50" width unit.
- ☐ Catalog No. 8713, use with 64½" width unit.
- ☐ Catalog No. 8714, use with 79" width unit.

K. Portable Breathguard.
- ☐ Catalog No. 8724.

L. Buffet Style Canopy.
- ☐ Catalog No. 8740, use with 50" unit. UL listed.
- ☐ Catalog No. 8741, use with 64½" unit. UL listed.
- ☐ Catalog No. 8742, use with 79" unit. UL listed

M. Low End Shelf.
- ☐ Catalog No. 8725. (Not for use with item I or M)

N. Buffet Style Canopy with Heat Lamps.
- ☐ Catalog No. 8743, use with 50" width unit. UL listed
- ☐ Catalog No. 8744, use with 64½" width unit. UL listed
- ☐ Catalog No. 8745, use with 79" width unit. UL listed.

O. Electrical Outlets (Not UL listed).
- ☐ Catalog No. 8696, Tombstone, Top Mounted, Duplex, 125V, 15 AMP
- ☐ Catalog No. 8697, Operator Side, Under Top Skirt, Duplex,120V,16 A
- ☐ Catalog No. 8698, Operator Side, Under Top Skirt, Single, 120V,15 A
- ☐ Catalog No. 8699, Operator Side, Under Top Skirt, Single, 120V, 15 AMP

Note: #8696 and #8697 are part of the module wiring. #8698 and #8699 have separate cord set.

Specifications subject to change without notice.



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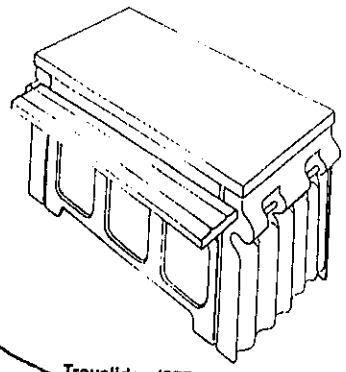
# Galley Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

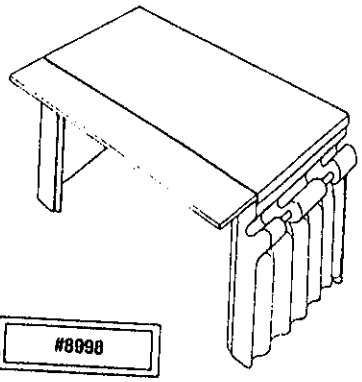
## Accessories



Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| New! 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029



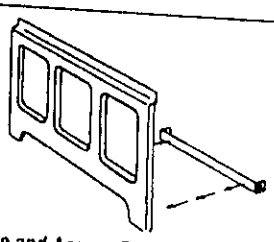
#8998

Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7 | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |

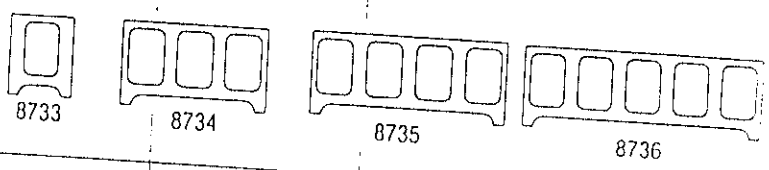
Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable** (NSF), Wood 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

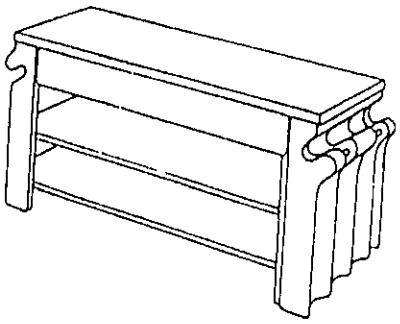


Closure and Access Panel (8734 Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. **Note: #9230, #9231, & #9630** cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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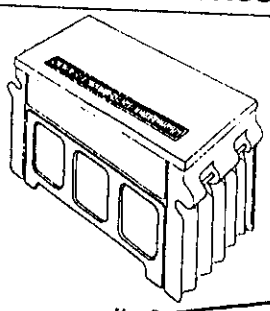
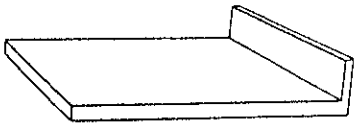
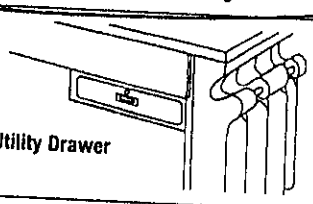
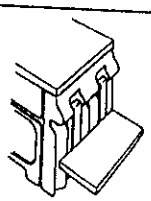
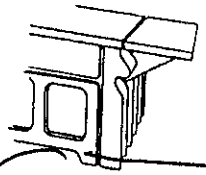
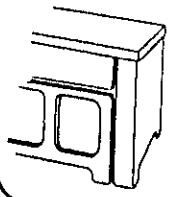
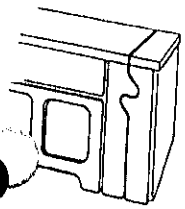
# Galley® Line

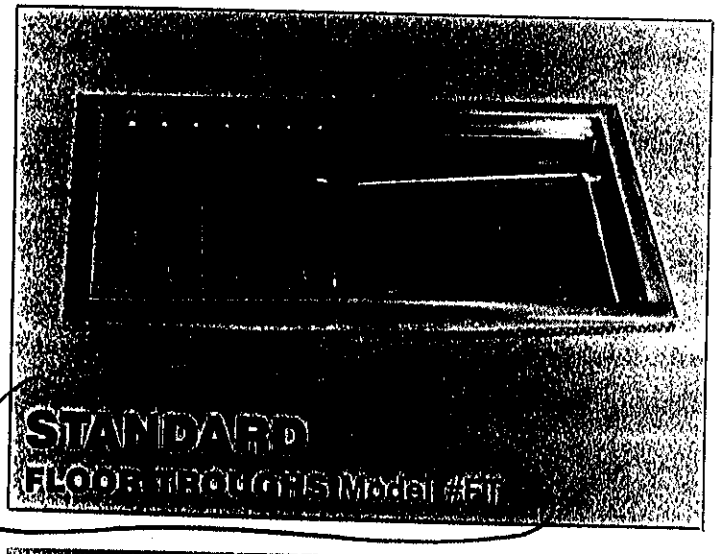
## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

| Accessories | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Urn Drains | Urn Drain Trough, Splash Guard, Drain Hose and Shut Off Valve | | | | | | | | |
| | 18" Urn Drain | 8715 | 10 | 8715 | 10 | 8715 | 10 | 8715 | 10 |
| | 24" Urn Drain | | | 8716 | 15 | 8716 | 15 | 8716 | 15 |
| | 30" Urn Drain | | | 8717 | 20 | 8717 | 20 | 8717 | 20 |
| | 36" Urn Drain | | | 8718 | 25 | 8718 | 25 | 8718 | 25 |
| | | Specify Location in Utility Module Top - to the Right, Left or Center of Customer. Bracing is Included for heavy loads. | | | | | | | |
|  Backsplash and Riser Mirror Finish Edges, Marine Edges | New! Backsplash and Riser, 4" High, #4 Finish S/S | 8660 | 10 | 8661 | 15 | 8662 | 20 | 8663 | 25 |
| | Corner Backsplash | 8689 | 7 | | | | | | |
| | Tri-Directional Backsplash | 8504 | 7 | | | | | | |
| | New! Backsplash For 9428 | 8504 | 10 | | | | | | |
| | New! Marine Edges | 8680 | 0 | 8681 | 0 | 8682 | 0 | 8683 | 0 |
| | Mirror Finish Edges | 8944 | 0 | 8945 | 0 | 8946 | 0 | 8947 | 0 |
|  Utility Drawer | Large Stainless Steel Utility Drawer with Removable Liner and Lock and Key Cannot Be used on Refrigerated Modules | Not Available | | 8760 | 44 | 8760 | 44 | 8760 | 44 |
| | | Specify Location– Right, Left or Center of Server. | | | | | | | |
| | Dimensions: Inside - 24.25"W x 23"D x 5"H, Outside 25.5"W x 23"D x 5.5"H. | | | | | | | | |
|  Low End Shelf - Removable 16" x 28" | Low End Shelf - 16" x 28" - 15" Above Floor Level For Trays or Plates | 8725 | 25 | 8725 | 75 | 8725 | 75 | 8725 | 75 |
|  Extension Shelf- Removable 16" x 28" | Extension Shelf - 16" x 28" - Flush to top For Extra Display, Cashier Counter, or Trays and Plates | 8754 | 17 | 8754 | 67 | 8754 | 67 | 8754 | 67 |
|  Permanent Flat Ends - #8731 Shown | Permanent Flat End | | | | | | | | |
| | Flat End - Right Replaces Male End | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge |
| | Flat End - Left Replaces Female End | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge |
| | Elementary School Height Modification | 8511 | | 8511 | | 8511 | | 8511 | |
| | | Pewter Tan #8731 and #8732, Dove White #8731W and 8732W, Black Pearl #8731A and #8732A | | | | | | | |
|  Removable Matelock Flat End Female #8762 Shown | Removable Matelock Flat End with two adjustable legs. Flat and Male Ends | 8761 | 53 | 8761 | 53 | 8761 | 53 | 8761 | 53 |
| | Flat and Female Ends | 8762 | 53 | 8762 | 53 | 8762 | 53 | 8762 | 53 |
| Adds 5 3/8" to length of module | | Order a male end #8761 to fit on the female end of a module. Order a female end #8762 to fit on the male end of a module. Pewter Tan: #8761 and #8762; Dove White: #8761W and #8762W; Black Pearl: #8761A and #8762A | | | | | | | |

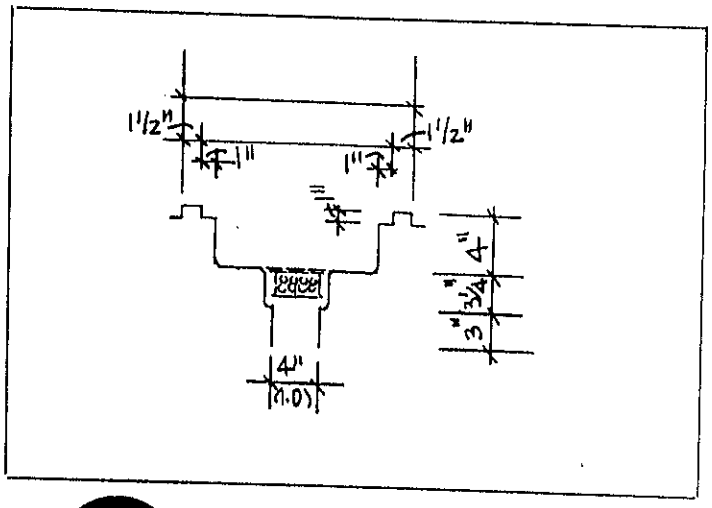
ITEM #91

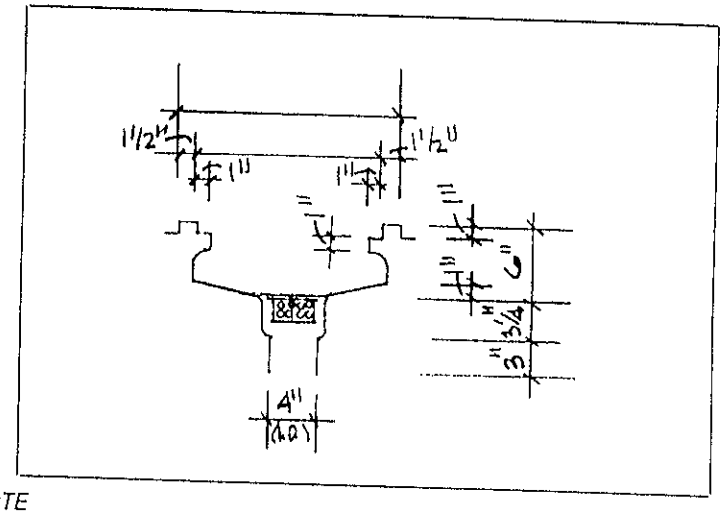
# STANDARD DEPTH FLOOR TROUGHS



## CONSTRUCTION

All floor troughs are constructed of heavy duty gauge stainless steel type 304- 18-8, completely welded and coved. All welds are ground & polished smooth. Troughs have built-in pitch towards wastes for complete drainage and anchor straps for securing. All troughs are fitted with special stainless steel waste cup with removable perforated stainless steel basket to accommodate up to 3" waste pipe. Advise size and location of waste outlet.




*NOTE*

*For troughs less than 15" wide 1½" top edge will become ¾".*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# GRATING FOR STANDARD TROUGHS

## SUBWAY GRATING /Model #SG

(All Type 304 Stainless Steel)

Grating to be constructed of 3/16″ x 1″ bars, set in a vertical position with open front and back for ease of draining.

Two (2) 1/2″ rods, set 3″ in from each edge, are wedged thru the bars full length. Three (3) 1/2″ rods are used for grating over 15″ wide.

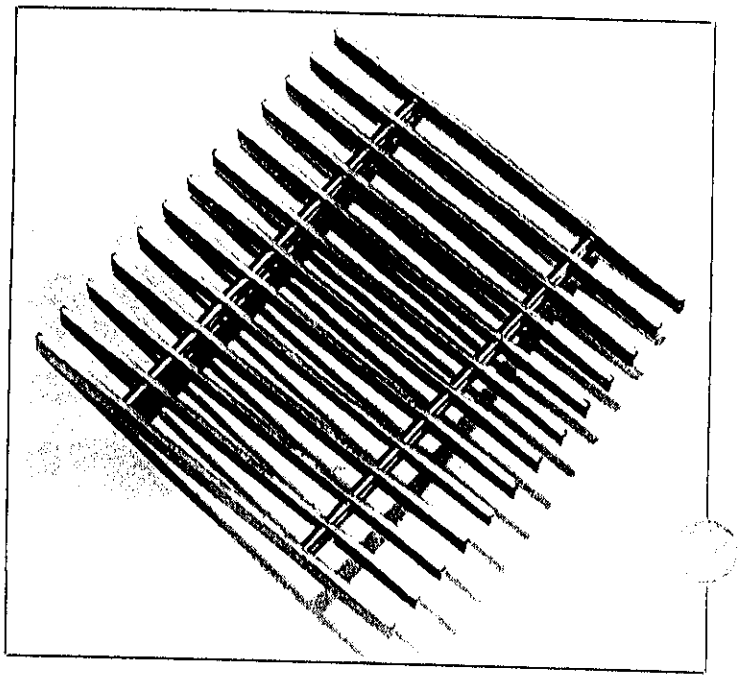
Rods are Heli Arc welded to each 3/16″ bar for rigidity thereby eliminating swaying and crevices.

There is 13/16″ clearance between bars so that wheels of mobile equipment will not become wedged.

Length of gratings are kept at maximum of 20″, for ease of handling and for cleaning in dishwasher.

(Longer lengths available upon request.)

(Bars can be had at any desired centers, specify)



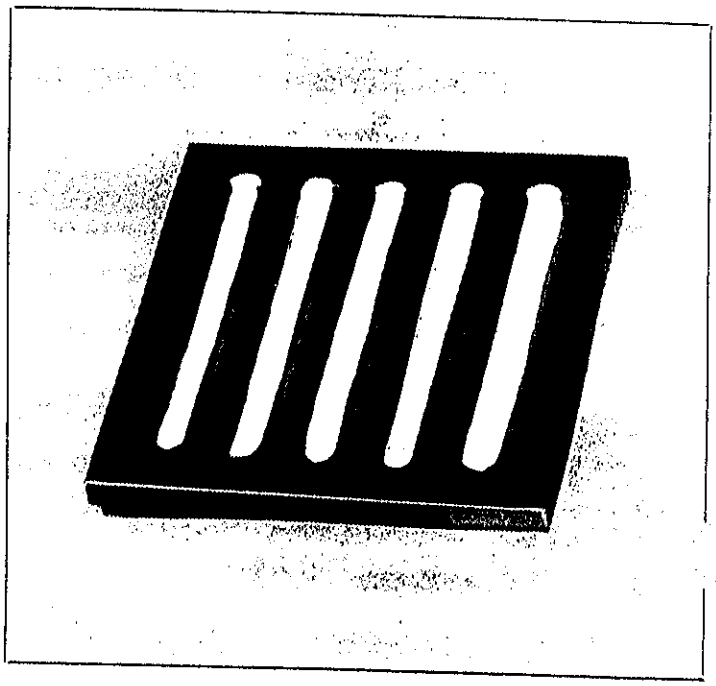
## LOUVERED GRATING /Model #FG

Grating to be fabricated of 14 gauge 18-8 type 304 stainless steel.

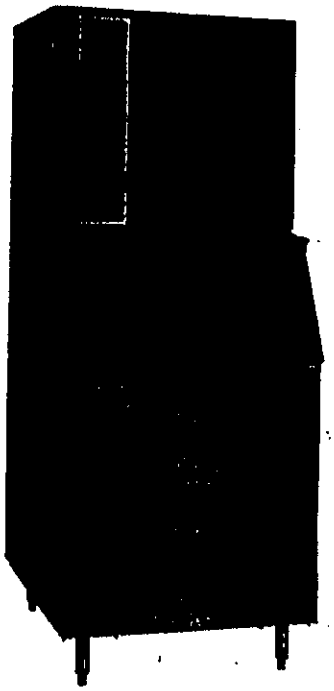
Gratings are 1″ thick and have die formed louvers, one piece design with a #3 polished finish.

They are fabricated in approximately 20″ lengths and are easily removed for cleaning in dishwasher.

(Longer lengths available upon request.)



#92

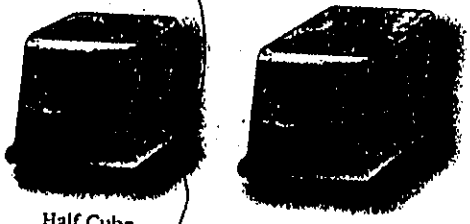


ICE 1000 shown on model B-55 Bin

## ICE 1000

**Produces up to 1201 lbs. (546 Kgs.)* of ice per day.**

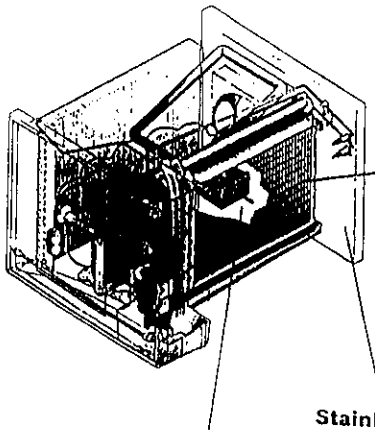
- Constructed from sturdy, corrosion-proof 304 stainless steel—inside and out.
- Most advanced "Harvest Assist" system gets ice to the bin quicker. It conserves energy and increases compressor life.
- Easy to service and install. The ICE Series™ machines have electro-mechanical controls.
- Works on all standard industry dispensers and bins.
- Environmentally responsible. All ICE Series™ machines use R-404A, an approved, non-ozone depleting refrigerant.
- Proven "classic cube" shape. Half cube and Full cube systems available.
- Available with an air-, water- or remote-cooled condenser.



Half Cube
7/8" x 7/8" x 3/8"

Full Cube
7/8" x 7/8" x 7/8"

Not shown actual size



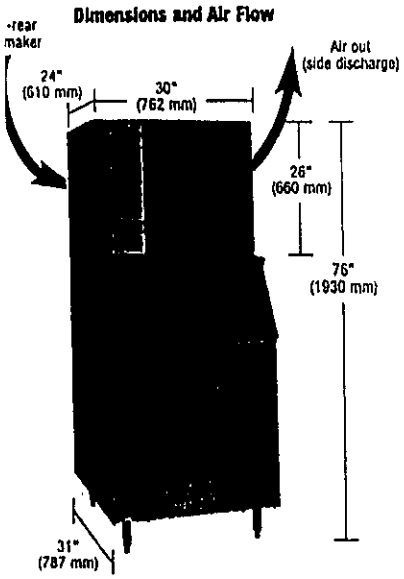

IOM **Ice-O-Matic**®

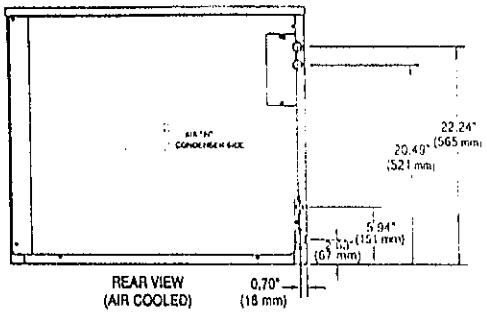
A WELBILT Company

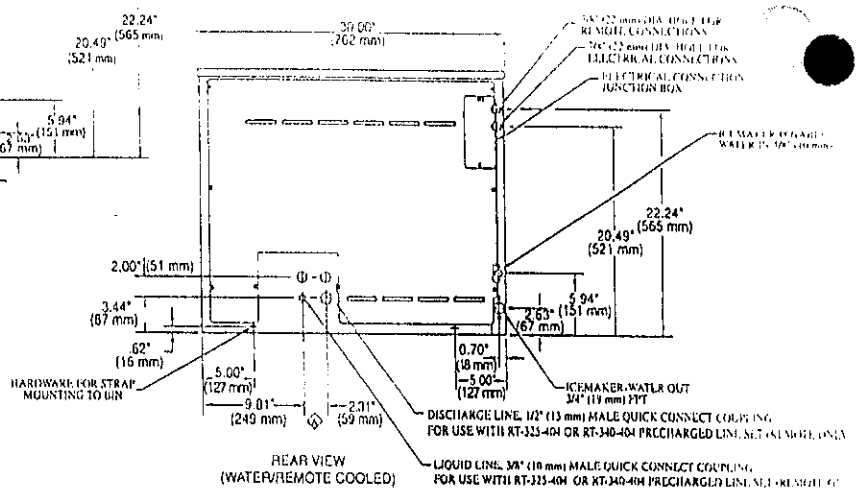
*Tested at 70° Air/50° Water

# ICE 1000 Series Cube Ice Maker

## Dimensions and Air Flow




## ICE PRODUCTION CHART POUNDS (KILOGRAMS) PER 24 HOURS

| Conds. Unit | ICE 1006 Air Temp. °F (°C) | Water Temp. °F (°C) 80°(27°) | 70°(21°) | 50°(10°) | ICE 1005 Air Temp. °F (°C) | Water Temp. °F (°C) 80°(27°) | 70°(21°) | 50°(10°) |
|---|---|---|---|---|---|---|---|---|
| Air Cooled | 90° (32°) | 754 (343) | 811 (369) | 930 (423) | 90° (32°) | 690 (314) | 742 (337) | 856 (389) |
| | 80° (27°) | 862 (392) | 927 (421) | 1020 (463) | 80° (27°) | 796 (362) | 856 (389) | 942 (428) |
| | 70° (21°) | 938 (426) | 1008 (458) | 1109 (504) | 70° (21°) | 868 (395) | 934 (424) | 1027 (467) |
| Water Cooled | 90° (32°) | 875 (398) | 941 (428) | 1013 (460) | 90° (32°) | 853 (388) | 917 (417) | 985 (448) |
| | 80° (27°) | 902 (410) | 970 (441) | 1067 (485) | 80° (27°) | 876 (398) | 942 (428) | 1036 (471) |
| | 70° (21°) | 948 (431) | 1019 (463) | 1121 (510) | 70° (21°) | 919 (418) | 988 (449) | 1087 (494) |
| Remote Cooled | 90° (32°) | 842 (383) | 905 (411) | 1023 (465) | 90° (32°) | 745 (339) | 801 (364) | 911 (414) |
| | 80° (27°) | 940 (427) | 1011 (460) | 1112 (506) | 80° (27°) | 840 (382) | 904 (411) | 994 (452) |
| | 70° (21°) | 1015 (461) | 1092 (496) | 1201 (546) | 70° (21°) | 910 (414) | 979 (445) | 1077 (490) |
| | 50° (10°) | | | 1225 (557) | 50° (10°) | | | 1099 (499) |
| | 30° (-1°) | | | 1250 (568) | 30° (-1°) | | | 1121 (509) |
| | 0° (-18°) | | | 1275 (579) | 0° (-18°) | | | 1143 (520) |

1. 90°/70° figures are rated in accordance with ARI Standard 810. All remaining points are mathematical estimates.
2. All specifications and performance data are subject to normal manufacturing variances.

## OPERATING LIMITS

| | |
|---|---|
| Ambient Temp. Range | |
| Air & Water | 50° - 110°F (10° - 43°C) |
| Remote | -20° - 110°F (-29° - 43°C) |
| Water Temp. Range | 40° - 100°F (4.5° - 38°C) |
| Water Pressure Ice Maker Water in | Min. 20 psi (1.4 bar)<br>Max. 60 psi (6.9 bar) |
| Condenser Inlet Water (Water cooled only) | Min. 20 psi (1.4 bar)<br>Max. 60 psi (6.9 bar) |

## ORDERING AND SPECIFICATION INFORMATION

| Model No. | Cond. Unit | Ice Production per 24 hrs. at 70° Air/50° Water lbs. (Kgs.) | Ice Production per 24 hrs. at 90° Air/70° Water lbs. (Kgs.) | Water Used-Gals. (Lits.) per 100 lbs. of Ice 90° Air/70° Water: Ice Prod. Use | Cond. Use | Kilowatts Used per 100 lbs. of Ice 90° Air 70° Water | Btuh | Voltage Characteristics | No. of Wires | Min. Circuit Amp. | Max. Fuse Size | Shipping Weight lbs. (Kgs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICE1006✣A | Air | 1109 (504) | 811 (369) | 20.6 (78) | n/a | 5.4 | 16239 | 208-230/60/1 | 3 | 13.8 | 20 | 225 (102) |
| ICE1006✣W | Water | 1121 (510) | 941 (428) | 23.7 (90) | 169.8 (643) | 3.8 | 15986 | 208-230/60/1 | 3 | 9.0 | 20 | 225 (102) |
| ICE1006✣R | Remote | 1201 (546) | 905 (411) | 19.1 (72) | n/a | 5.4 | 16149 | 208-230/60/1 | 3 | 13.8 | 20 | 225 (102) |
| ICE1005✣A | Air | 1027 (467) | 742 (337) | 21.8 (83) | n/a | 6.0 | 15699 | 230/50/1 | 3 | 13.3 | 15 | 225 (102) |
| ICE1005✣W | Water | 1087 (494) | 917 (417) | 23.6 (89) | 170.5 (645) | 4.0 | 16005 | 230/50/1 | 3 | 9.5 | 15 | 225 (102) |
| ICE1005✣R | Remote | 1077 (490) | 801 (364) | 22.4 (85) | n/a | 5.5 | 16127 | 230/50/1 | 3 | 15.1 | 15 | 225 (102) |
| ERC-2061 | Remote Condenser for 1 model ICE 1000R (208-230/50-60/1 voltage) | | | | | | | | | | | 95 (43) |
| ERC-2062 | Remote Condenser for 1 or 2 model ICE 1000R (208-230/50-60/1 voltage) | | | | | | | | | | | 125 (57) |
| RT-325-404 | 25 ft. (7.6m) Precharged Tubing Kit for R-404A models | | | | | | | | | | | 13 (6) |
| RT-340-404 | 40 ft. (12m) Precharged Tubing Kit for R-404A models | | | | | | | | | | | 18 (8) |

See Bin specification sheet for information on ice storage bins

✣ represents cube size. For full cube substitute an "F", for half cube substitute an "H".
Please note: air-cooled units require 6" (152 mm) clearance for air intake and exhaust.


Ice-O-Matic/Mile High 11100 E. 45th Avenue, Denver, CO 80239
Tel. 303 371-3737 Fax. 303 371-6296 www.icecomatic.com



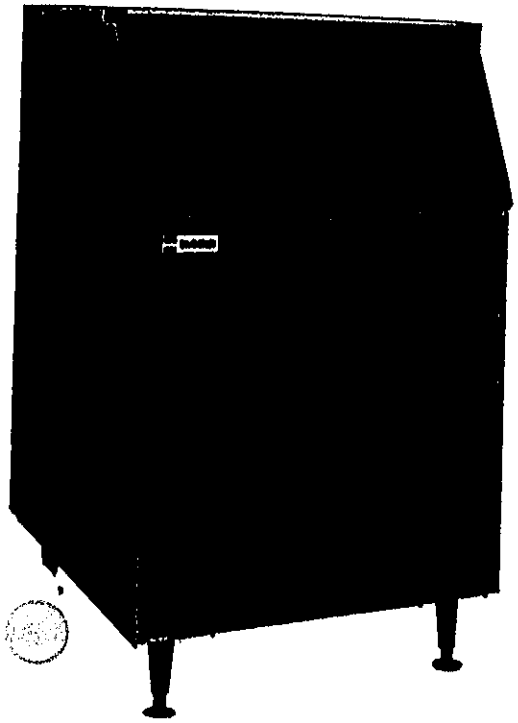
We reserve the right to make changes in design and construction at any time without obligation.
©Mile High Equipment Company

#92

## B Series

### Storage capacity from 255 lbs. (116 Kgs.) to 1866 lbs. (848 Kgs.).

- Dependable storage for either cube ice or flake ice.
- Use with ICE, ECP, GC or EMF Series ice makers.



**Model B55 Storage Bin**

**B25 to B100**

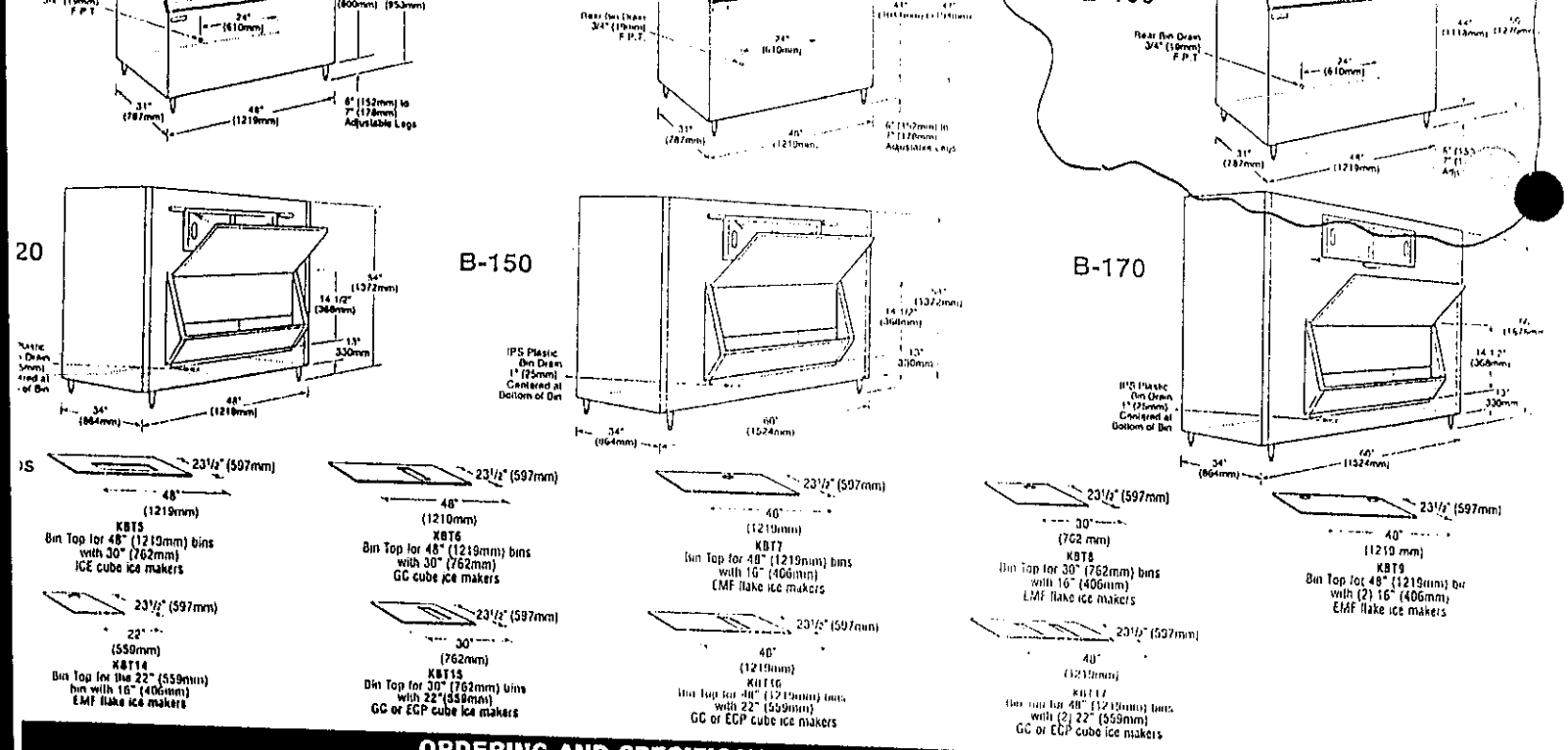
- Insulated on all sides and bottom with foamed-in-place polyurethane. Non-corrosive bin liner and molded plastic door.
- Stainless steel exterior (except B25 which has polyethylene molded exterior and interior).
- 6" to 7" (152 to 178mm) adjustable NSF approved legs.
- Bin drains are located at the rear of cabinet.

**B120 to B170**

- "SP" models have all stainless steel front and side panels, and galvanized back and bottom.
- "SS" models are all stainless steel: front, back, bottom, top and sides. All stainless steel is 300 series.
- All welded stainless steel door frame with all stainless steel, fully insulated, and gasketed door, providing a completely sanitary seal. Hold open clips provided for convenience when using door.
- Roto molded snout is dent and scratch resistant. The snout clips to bin front for convenience and safety. It can be easily removed for shoveling ice and cleaning.
- Sliding, plastic view window provides access for ice breakup.
- Bin liner is polyethylene. Foamed-in-place insulation is 2" (51mm) thick on bottom and 1-1/2" (38mm) on walls, providing maximum ice preservation.
- 6" (152mm) adjustable black metal legs standard.

IOM **Ice-O-Matic**®

A WELBILT Company




## ORDERING AND SPECIFICATION INFORMATION

| Model No. | Bin Storage Lbs (Kgs) | Use with cube Ice Maker Model | Bin Top | Use with Flake Ice Maker Model | Bin Top | Shipping Weight Lbs. (Kgs.) |
|---|---|---|---|---|---|---|
| 25PP | 255 (116) | 30" (762mm) ICE<br>22" (559mm) GC,ECP | Not Required<br>KBT15 | 16" (406mm) Flaker | KBT8 | 95 (43) |
| 40PS | 365 (166) | 30" (762mm) ICE<br>22" (559mm) GC,ECP | Not Required<br>KBT15 | 16" (406mm) Flaker | KBT8 | 135 (61) |
| 12PS | 374 (170) | 22" (559mm) GC,ECP | Not Required | 16" (406mm) Flaker | KBT14 | 135 (61) |
| 5PS | 556 (253) | 30" (762mm) ICE<br>22" (559mm) GC,ECP<br>30" (762mm) GC | Not Required<br>KBT15<br>Not Required | 16" (406mm) Flaker | KBT8 | 175 (80) |
| 0PS | 580 (264) | 30" (762mm) ICE<br>48" (1219mm) ICE<br>22" (559mm) GC,ECP<br>30" (762mm) GC | KBT5<br>Not Required<br>KBT16<br>KBT6 | 16" (406mm) Flaker<br>48" (1219mm) Flaker | KBT7<br>Not Required | 185 (84) |
| 0PS | 800 (364) | 30" (762mm) ICE<br>48" (1219mm) ICE<br>22" (559mm) GC,ECP<br>30" (762mm) GC | KBT5<br>Not Required<br>KBT16<br>KBT6 | 16" (406mm) Flaker<br>48" (1219mm) Flaker | KBT7<br>Not Required | 225 (102) |
| 00PS | 927 (421) | 30" (762mm) ICE<br>48" (1219mm) ICE<br>22" (559mm) GC,ECP<br>30" (762mm) GC | KBT5<br>Not Required<br>KBT16<br>KBT6 | 16" (406mm) Flaker<br>48" (1219mm) Flaker | KBT7<br>Not Required | 230 (105) |
| 20SP✣/SS | 1193 (542) | Any Cuber | Included | Any Flaker | Included | 345 (157) |
| 50SP✣/SS | 1499 (681) | Any Cuber | Included | Any Flaker | Included | 355 (161) |
| 70SP✣/SS | 1866 (848) | Any Cuber | Included | Any Flaker | Included | 375 (171) |

= Bin top is included - must specify icemaker application when ordering bin.


-O-Matic/Mile High 11100 E. 45th Avenue, Denver, CO 80239
303 371-3737 Fax. 303 371-6296 www.iceomatic.com



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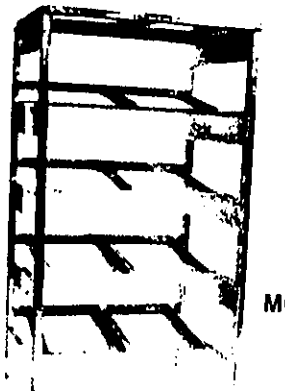
QUANTITY ITEM NO #94

# YRUP CONTAINER RACKS

## RIES BIB AND STR



MODEL BIB57-1216-8

MODEL STR2

### SPECIFICATIONS

Series BIB aluminum "bag-in-box" syrup container rack.

**FRAME:** The uprights are 1" x 2" x ⅛" thick extruded aluminum channels and the cross members are 1⅞" x 4" x 1⅞" x ⅛" thick aluminum channels, welded together to form a rigid structure. A solid reinforced top of .060" thick aluminum is securely fastened to the uprights and cross bracing. The uprights are fitted with adjustable flanged feet.

**SHELVES:** The shelves are all-welded open frames fabricated of 1" x 2" x 3/16" thick aluminum angles and set on an incline in the frame to receive the box syrup containers. Clearance between the supports is 12".

ODEL BIB57-1216-8 "BAG-IN-BOX" RACK
Dimensions: 30¾"W x 24 3/16"D x 57"H
Capacity: 8 syrup boxes
Shipping weight: 80 lbs.
**NOTE:** Other sizes and capacities available.

---

Series STR aluminum syrup tank racks.

**FRAME:** The uprights are 1" x 2" x ⅛" thick extruded aluminum channels and the cross bracing is 1¼" x 2" x ⅛" channels and 2" x 2" x ⅛" aluminum angles, fully welded to form a rigid structure. Between the uprights, 1" square aluminum tubing is welded horizontally on the rear and sides, to act as retainers for the metal syrup tanks. The uprights are fitted with adjustable bullet feet.

**SHELVES:** The bottom shelf is fabricated of .100" thick aluminum turned up 1" on the ends and rear and turned down 2" on the front. It is reinforced longitudinally with two 1" x 3" x ⅛" thick tubular members and crosswise with two 2" x 4" x ⅛" flanged channels. The upper shelves are .100" thick aluminum with .140" thick formed dividers to hold the empty syrup tanks in position.

**REAR PANEL:** A full length x 8" x .100" thick aluminum panel is welded in place on the rear side to provide a mounting surface for the beverage system components as supplied and installed by others.

**OPTIONAL ITEM (Series STR)**

☑ Top shelf solid (reinforced) in lieu of channels.

☐ MODEL STR1 (one upper shelf)
Dimensions: 48¼"W x 24"D x 42"H
Capacity: 10 full syrup tanks and 5 empty tanks
Shipping weight: 60 lbs.

☐ MODEL STR2 (two upper shelves)
Dimensions: 48¼"W x 24"D x 56"H
Capacity: 10 full syrup tanks and 10 empty tanks
Shipping weight: 80 lbs.

☑ MODEL STR3 (three upper shelves)
Dimensions: 48¼"W x 24"D x 70"H
Capacity: 10 full syrup tanks and 15 empty tanks
Shipping weight: 100 lbs.

OTE: Other sizes and capacities available.



SERVOLIFT EASTERN CORPORATION
266 HANCOCK STREET, BOSTON, MASSACHUSETTS 02125
(617) 825-9000 • FAX: (617) 825-1292

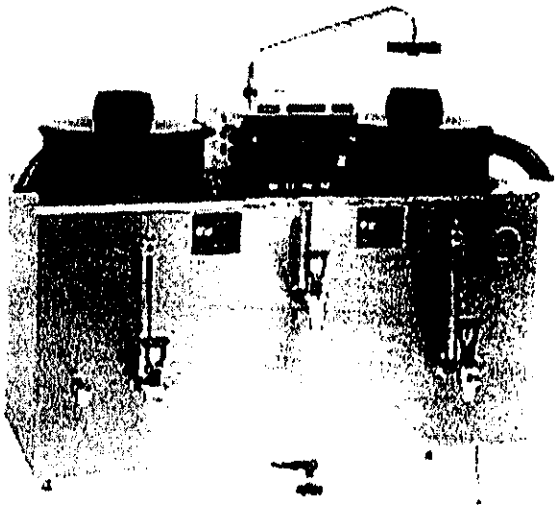
# BUNN®

# Twin 3 Gallon Automatic Electric Coffee Urn

## Features

### Automatic Electric Coffee Urn

- Brews 18.1 to 20.9 gallons of perfect coffee per hour.
- Unique design assures extremely low evaporation loss to maintain the brew at its flavorful peak.
- Large water tank–over 20 gallons.
- Draw off hot water during brewing cycle without affecting coffee quality.
- Half-batch option.
- Top mounted components for ease of service.
- All stainless steel construction.
- Variety of faucet configurations available; including double service with faucets on both front and back.
- International electrical configurations available.



*Model U3*

#95
ITEM#

PROJECT

DATE

## Model

*U3*

## Related Products

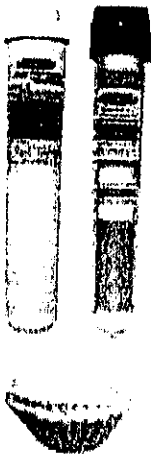
**For available variations to some BUNN products, please contact your BUNN sales representative.**

BUNN recommends the use of our Easy Clear® Water Quality Systems and BUNN paper filters to assure perfect taste.

**Easy Clear® EQ-12-TL**
Product No.: 30345.1001
Dimensions:
20⅛" H x 3⅝" W x 4 17/32" D

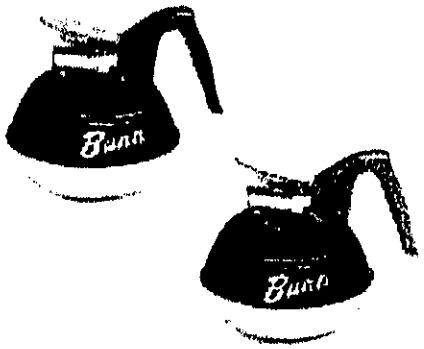
**Easy Clear® ED-12-TL**
Product No.: 30201.0001
Dimensions:
23¾" H x 5 3/16" W x 5 3/16" D

**SRU Paper Filters**
Product No.: 20109.0000
Packed per case: 250
Dimensions: 7" Base x 5¼" Sidewall



**EasyPour® black decanter**
Product No.: 06100.0101
Quantity: 1 (also packaged in quantities of 2, 3, 6, 12, & 24)

**EasyPour® orange decanter (for decaf)**
Product No.: 06101.0101
Quantity: 1 (also packaged in quantities of 2, 3, 6, 12, & 24)




BUNN® practices continuous product research and improvement. We reserve the right to change specifications and product design without notice. Such revisions do not entitle the buyer to corresponding changes, improvements, additions or replacements for previously purchased equipment.

**BUNN®**

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280 Industrial Parkway South
Aurora, Ontario, L4G 3T9
**Phone**
905-841-2866
**Fax**
905-841-2775

Patents Apply

# BUNN®

*The Mark of Quality in Beverage Equipment Worldwide*

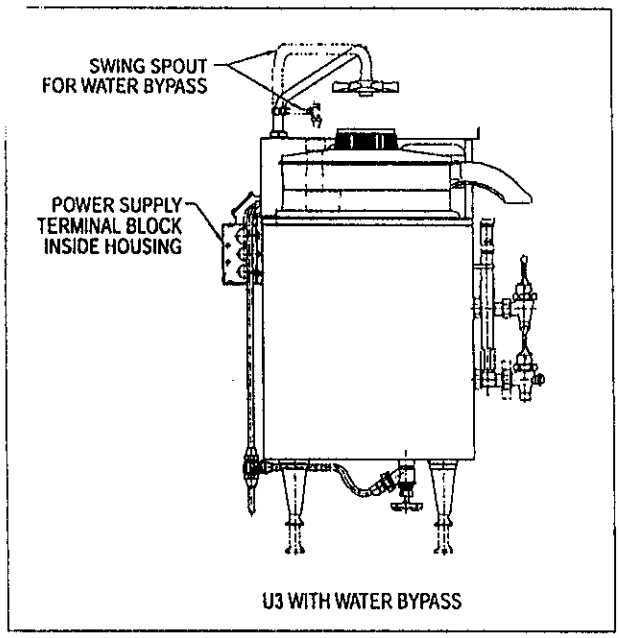
## Dimensions & Specifications

| Model | Product # | Volts | Amps | Tank Heater Watts | Total Watts | Brewing Capacity | Cu. Ft. | Shipping Weight | Cord Attached |
|---|---|---|---|---|---|---|---|---|---|
| U3 (SS) | 20500.0000 | 120/208 | 28.56 | 5750 | 5860 | 18.1 gal./hr. | 18.2 | 106 lbs. (48.2 kg) | No |
| U3 (SS) | 20500.0001 | 120/240 | 28.62 | 6650 | 6760 | 20.9 gal./hr. | 18.2 | 106 lbs. (48.2 kg) | No |
| U3 (DS) | 20520.0001 | 120/240 | 28.68 | 6650 | 6760 | 20.9 gal./hr. | 18.2 | 112 lbs. (50.9 kg) | No |

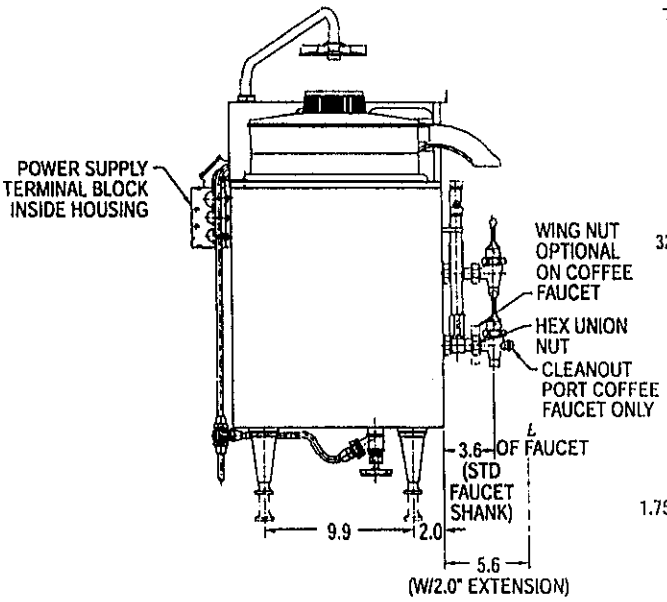
*Note: SS=Single Service; DS=Double Service*

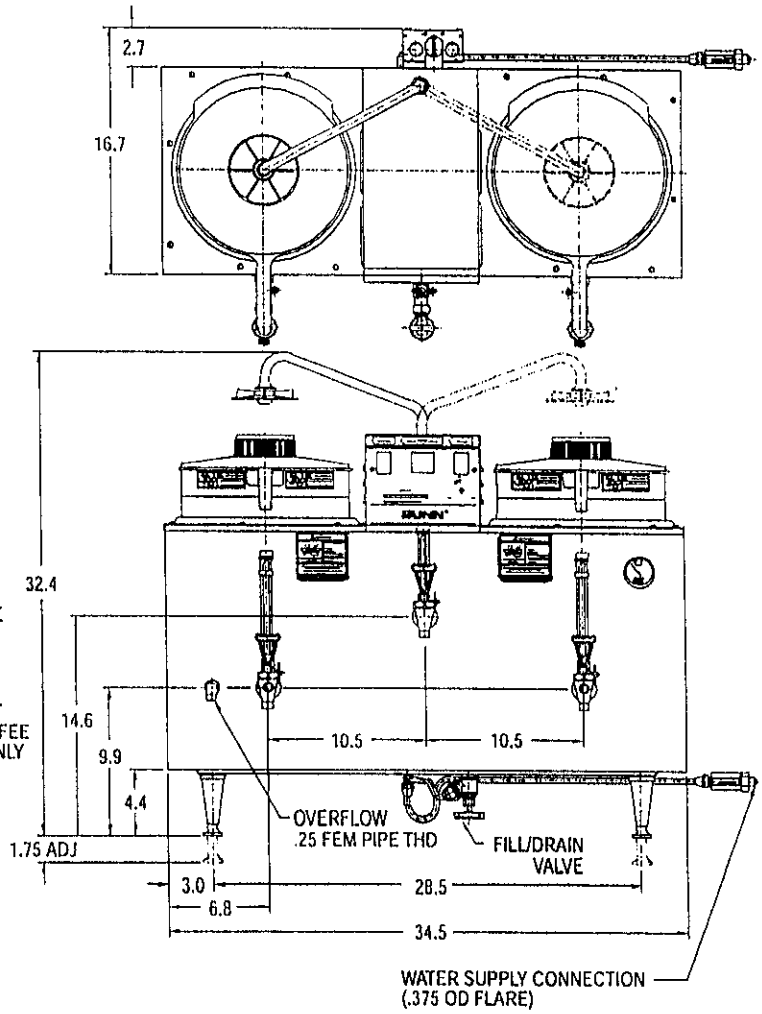
Electrical: Model requires 3-wires plus ground service rated 120/240V, single phase, 60 Hz.

Plumbing: 20-90 psi (138-621 kPa). Supplied with ⅜" OD male flare fitting.




U3 WITH WATER BYPASS




**All dimensions shown in inches.**

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# Galley® Line

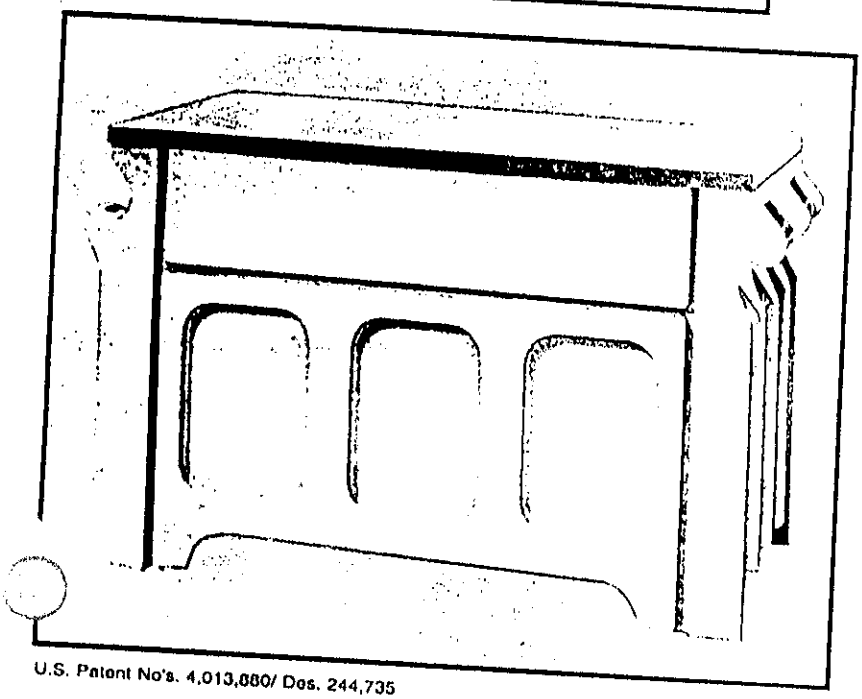
## Sanitary, Heavy Duty

## Flat Top Utility Module

Item No. #97

**Model No. 9310**
**Model No. 9330**
**Model No. 9340**
**Model No. 9350**

A1A11420



U.S. Patent No's. 4,013,680/ Des. 244,735

**Utility Module** – Attractively merchandises and sells pastries and breads. Helps to increase check averages. Available in four widths.

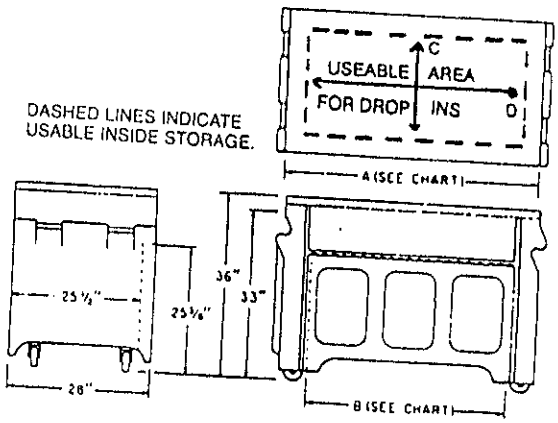
- Aesthetic design, three neutral colors, dove white, pewter tan or black pearl blend in with any surroundings.
- Four built-in & concealed stainless steel handles allow easy portability.
- Self-locking and self-aligning features eliminate time consuming hookup.
- Lightweight but extra-strong construction provides ease of mobility.
- Casters and brakes are almost completely concealed from patron's view.
- Soft textured surfaces and rounded corners help prevent skin cuts and clothing snags.

**Utility Module**

| Cat. No. | Module Size W | D | H | Shpg. Wt. Lbs. | Quantity of Decorator Panels Included |
|---|---|---|---|---|---|
| 9310 | 28" | 28" | 36" | 105 | 1 |
| 9330 | 50" | 28" | 36" | 170 | 3 |
| 9340 | 64 ½" | 28" | 36" | 195 | 4 |
| 9350 | 79" | 28" | 36" | 225 | 5 |

SPECIFICATION DRAWING OF BASIC UNIT

DASHED LINES INDICATE USABLE INSIDE STORAGE.




| Cat. No. | Dim. 'A' | Dim. 'B' | Dim. 'C' | Dim. 'D' |
|---|---|---|---|---|
| 9310 | 28" | 17" | 22 ¾" | 22" |
| 9330 | 50" | 39" | 22 ¾" | 44" |
| 9340 | 64 ½" | 53 ½" | 22 ¾" | 58 ½" |
| 9350 | 79" | 68" | 22 ¾" | 73" |

To be **Galley® Line** Flat Top Utility Module_____ with accessories as specified.

**GENERAL:** Unit to be self-contained, mobile Utility module for room temperature foods. Body material to be one of three neutral base colors, dove white, pewter tan or black pearl. "Matelock" self-locking and aligning end panels allow modules to be interconnected. To have recessed push handles at each end. Removable side panel on customer's side to be recessed to accept decorator panels. Server's side to be open to accept accessories. To be listed by National Sanitation Foundation and Underwriters Laboratories, Inc.

**CONSTRUCTION:** Body material to be of flame retardant ABS formed plastic fastened to galvaneal undercarriage. 14 ga. 300 series stainless steel top to have not less than #4 finish. Plate mounted 4" diameter swivel casters with toe brakes to be provided.

**NOTE:** If unit is to be used independently, add 4" to width for clearance on all specifications. Add 3 ½" to depth for folded trayslide and 3 ¼" for folded cutting board.

# Galley Line Flat Top Utility Module
# Model No's. 9310, 9330, 9340, 9350

ACCESSORIES:

A. Decorator panels, specify catalog number and quantity. (See chart on front side).
- ☐ Catalog No. 8700 American Walnut, Quantity_____ Included.
- ☐ Catalog No. 8701 Teakwood, Quantity_____.
- ☐ Catalog No. 8702 Plain Custom Panel, Quantity_____.

B. Folding Trayslides. All stainless steel with die-stamped three-rib reinforcement.
- ☐ Catalog No. 8771, (*Short 28") 20 7/8" width, used on 9310.
- ☐ Catalog No. 8772, 28" width, used on 9310.
- ☐ Catalog No. 8773, (*Short 50") 42 7/8" width, used on 9330.
- ☐ Catalog No. 8774, 50" width, used on 9330.
- ☐ Catalog No. 8775, (*Short 64 1/2") 57 3/8" width, used on 9340.
- ☐ Catalog No. 8776, 64 1/2" width, used on 9340.
- ☐ Catalog No. 8777, (*Short 79") 71 7/8" width, used on 9350.
- ☐ Catalog No. 8778, 79" width, used on 9350.

*Note: A short trayslide must be used on the first module to the right of Corner In-Fill Module for inside turns.

C. Food Protector with plastic shelf, breathguard and stainless steel upright supports. 14" high. Field mounted. Not available on model 9310.
- ☐ Catalog No. 8780, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8791, 50" width, used on 9330. Lighted. UL listed.
- ☐ Catalog No. 8781, 64 1/2" width, used on 9340. Unlighted.
- ☐ Catalog No. 8792, 64 1/2" width, used on 9340. Lighted. UL listed.
- ☐ Catalog No. 8782, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8793, 79" width, used on 9350. Lighted. UL listed.

D. Double Deck Display Stand with two plastic shelves, breathguard and stainless steel upright supports. 18" high.
- ☐ Catalog No. 8785, 50" width, used on 9330. Unlighted.
- ☐ Catalog No. 8788, 50" width, used on 9330. Lighted.
- ☐ Catalog No. 8786, 64 1/2" width, used on 9340. Unlighted.
- ☐ Catalog No. 8789, 64 1/2" width, used on 9340. Lighted.
- ☐ Catalog No. 8787, 79" width, used on 9350. Unlighted.
- ☐ Catalog No. 8790, 79" width, used on 9350. Lighted.

E. Folding Cutting Board. All plastic. Mounted flush on server's side. Not available on Model 9310.
- ☐ Catalog No. 8763, 50" width, used on 9330.
- ☐ Catalog No. 8764, 64 1/2" width, used on 9340.
- ☐ Catalog No. 8765, 79" width, used on 9350.

F. Extension shelf. Stainless steel. Mounted flush with top of module. Self-mounting. 16" wide x 28" deep.
- ☐ Catalog No. 8754. (Not for use with item L or M).

G. Undercounter Shelving System. Maximum: two per unit. All stainless steel. Removable. 18" depth with 1" front edge.
- ☐ Catalog No. 8756, 19 1/2" width, used on 9310.
- ☐ Catalog No. 8757, 41 1/2" width, used on 9330.
- ☐ Catalog No. 8758, 56 1/16" width, used on 9340.
- ☐ Catalog No. 8759, 70 1/2" width, used on 9350.

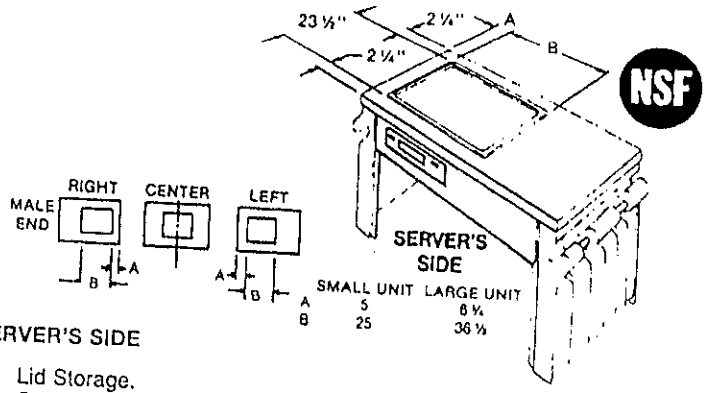
H. Utility Drawer. Stainless steel. Has lock and removable liner. Outside dimensions: 25 1/4"W x 23"D x 7 1/4"H. Mounted to right on server's side. Will not fit Model 9310.
- ☐ Catalog No. 8760.

I. "Mateflat" Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring unit to wall.) Size 5 7/8"W x 28"D x 36"H.
- ☐ Catalog No. 8761 Male Panel (Fits female end).
- ☐ Catalog No. 8762 Female Panel (Fits male end).

J. Heated Shelf.
- ☐ Catalog No. 8726, use with 50" unit.

K. Griddle.
- ☐ Catalog No. 8728, 25" 208-240V, 1 & 3 phase. UL listed.
- ☐ Catalog No. 8729, 36 1/2" 208V, 1 & 3 phase, UL listed.
- ☐ Catalog No. 8730, 36 1/2" 240V, 1 & 3 phase. UL listed.

Griddle: Controlled by dual-variable thermostats with signal lights. Top is one-half inch thick polished steel. Grease trough empties into front removable grease drawer. Griddle furnished with stainless steel cover.




SERVER'S SIDE

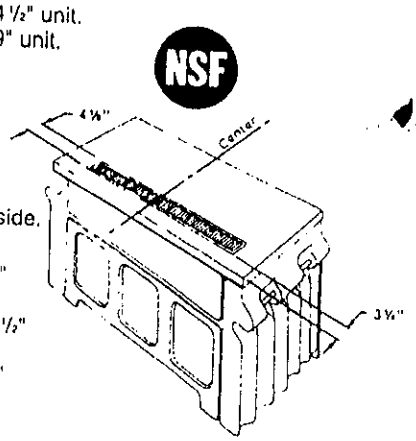
L. Lid Storage.
- ☐ Catalog No. 8727.

M. Flat End Panel. (Makes any Galley unit compatible with any other serving line equipment or for squaring to wall.)
- ☐ Catalog No. 8731, Replaces female "matelock".
- ☐ Catalog No. 8732, Replaces male "matelock".

N. Cutting Board for Griddle.
- ☐ Catalog No. 8763, use with 50" unit.
- ☐ Catalog No. 8764, use with 64 1/2" unit.
- ☐ Catalog No. 8765, use with 79" unit.

O. Drain.
- ☐ Catalog No. 8715, 18" long.
- ☐ Catalog No. 8716, 24" long.
- ☐ Catalog No. 8717, 30" long.
- ☐ Catalog No. 8718, 36" long.

Drain trough with drain hose and valve to be located on customer's side.




P. Merchandising Shelf.
- ☐ Catalog No. 8722, use with 50" width unit.
- ☐ Catalog No. 8713, use with 64 1/2" width unit.
- ☐ Catalog No. 8714, use with 79" width unit.

Q. Portable Breathguard.
- ☐ Catalog No. 8724.

R. Buffet Style Canopy.
- ☐ Catalog No. 8740, use with 50" width unit. UL listed.
- ☐ Catalog No. 8741, use with 64 1/2" width unit. UL listed.
- ☐ Catalog No. 8742, use with 79" width unit. UL listed.

Specifications subject to change without notice.

S. Low End Shelf.
- ☐ Catalog No. 8725. (Not for use with item I or M).

T. Buffet Style Canopy with Heat Lamps.
- ☐ Catalog No. 8743, use with 50" unit. UL listed.
- ☐ Catalog No. 8744, use with 64 1/2" unit. UL listed.
- ☐ Catalog No. 8745, use with 79" unit. UL listed .

U. Close-Off for Server's Side.
- ☐ Catalog No. 8733, use with 28" width unit.
- ☐ Catalog No. 8734, use with 50" width unit.
- ☐ Catalog No. 8735, use with 64 1/2" width unit.
- ☐ Catalog No. 8736, use with 79" width unit.

V. Electrical Outlets (Not UL listed).
- ☐ Catalog No. 8696, Tombstone, Top Mounted, Duplex, 125V, 15 AMP.
- ☐ Catalog No. 8697, Operator Side, Under Top Skirt, Duplex, 120V, 16 AMP.
- ☐ Catalog No. 8698, Operator Side, Under Top Skirt, Duplex, 120V, 15 AMP.
- ☐ Catalog No. 8699, Operator Side, Under Top Skirt, Single, 120V, 15 AMP

Note: #8696 and #8697 are part of the module wiring. #8698 and #8699 have separate cord set.



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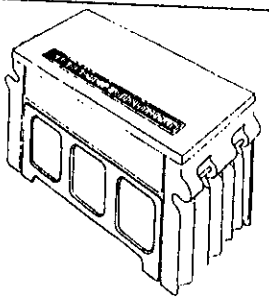
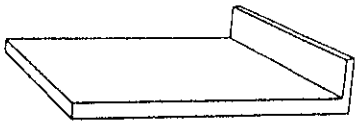
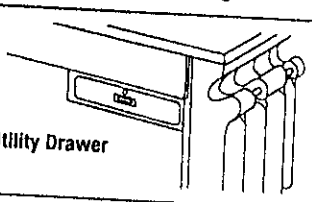
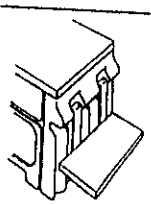
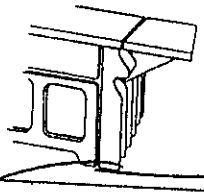
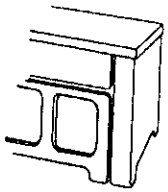
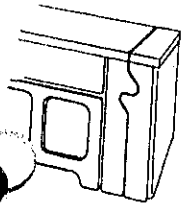
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

## Accessories

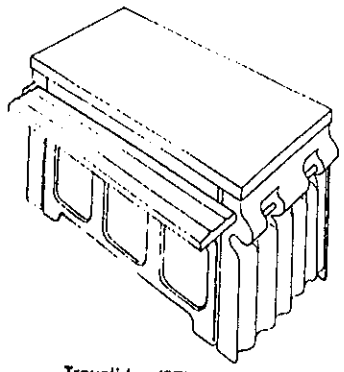
| | Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model | Lbs. | To Fit 79" Width Model | Lbs. |
|---|---|---|---|---|---|---|---|---|---|
|  Urn Drains | Urn Drain Trough, Splash Guard, Drain Hose and Shut Off Valve | | | | | | | | |
| | 18" Urn Drain | 8715 | 10 | 8715 | 10 | 8715 | 10 | 8715 | 10 |
| | 24" Urn Drain | | | 8716 | 15 | 8716 | 15 | 8716 | 15 |
| | 30" Urn Drain | | | 8717 | 20 | 8717 | 20 | 8717 | 20 |
| | 36" Urn Drain | | | 8718 | 25 | 8718 | 25 | 8718 | 25 |
| | | Specify Location in Utility Module Top - to the Right, Left or Center of Customer. Bracing is Included for heavy loads. | | | | | | | |
|  Backsplash and Riser Mirror Finish Edges, Marine Edges | New! Backsplash and Riser, 4" High, #4 Finish S/S | 8660 | 10 | 8661 | 15 | 8662 | 20 | 8663 | 25 |
| | Corner Backsplash | 8689 | 7 | | | | | | |
| | Tri-Directional Backsplash | 8504 | 7 | | | | | | |
| | New! Backsplash For 9428 | 8504 | 10 | | | | | | |
| | New! Marine Edges | 8680 | 0 | 8681 | 0 | 8682 | 0 | 8683 | 0 |
| | Mirror Finish Edges | 8944 | 0 | 8945 | 0 | 8946 | 0 | 8947 | 0 |
|  Utility Drawer | Large Stainless Steel Utility Drawer with Removable Liner and Lock and Key Cannot Be used on Refrigerated Modules | Not Available | | 8760 | 44 | 8760 | 44 | 8760 | 44 |
| | | Specify Location– Right, Left or Center of Server. | | | | | | | |
| | Dimensions: Inside - 24.25"W x 23"D x 5"H, Outside 25.5"W x 23"D x 5.5"H. | | | | | | | | |
|  Low End Shelf - Removable 16" x 28" | Low End Shelf - 16" x 28" - 15" Above Floor Level For Trays or Plates | 8725 | 25 | 8725 | 75 | 8725 | 75 | 8725 | 75 |
|  Extension Shelf- Removable 16" x 28" | Extension Shelf - 16" x 28" - Flush to top For Extra Display, Cashier Counter, or Trays and Plates | 8754 | 17 | 8754 | 67 | 8754 | 67 | 8754 | 67 |
|  Permanent Flat Ends - #8731 Shown | Permanent Flat End | | | | | | | | |
| | Flat End - Right Replaces Male End | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge | 8731 | 0 No Charge |
| | Flat End - Left Replaces Female End | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge | 8732 | 0 No Charge |
| | Elementary School Height Modification | 8511 | | 8511 | | 8511 | | 8511 | |
| | | Pewter Tan #8731 and #8732, Dove White #8731W and 8732W, Black Pearl #8731A and #8732A | | | | | | | |
|  Removable Matelock Flat End Female #8762 Shown | Removable Matelock Flat End with two adjustable legs. | | | | | | | | |
| | Flat and Male Ends | 8761 | 53 | 8761 | 53 | 8761 | 53 | 8761 | 53 |
| | Flat and Female Ends | 8762 | 53 | 8762 | 53 | 8762 | 53 | 8762 | 53 |
| Adds 5 3/8" to length of module | | Order a male end #8761 to fit on the female end of a module. Order a female end #8762 to fit on the male end of a module. Pewter Tan: #8761 and #8762; Dove White: #8761W and #8762W; Black Pearl: #8761A and #8762A | | | | | | | |

# Galley Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

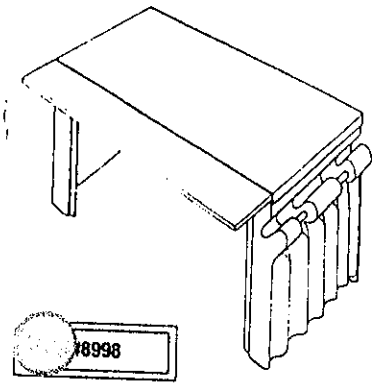
## Accessories



Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| New! 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029

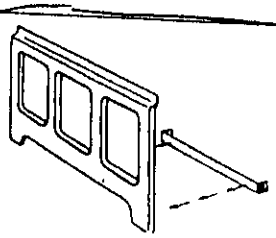


Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7/8" | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |

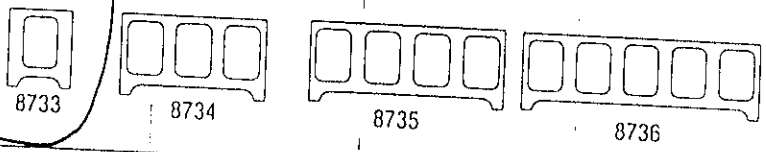
Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843.

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built in Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

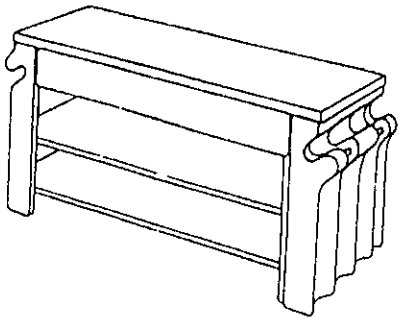


Closure and Access Panel (8734 Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)

Interior Stainless End Liners (Not Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. **Note: #9230, #9231, & #9630** cannot accommodate an undershelf. Undershelves not available for corner modules. | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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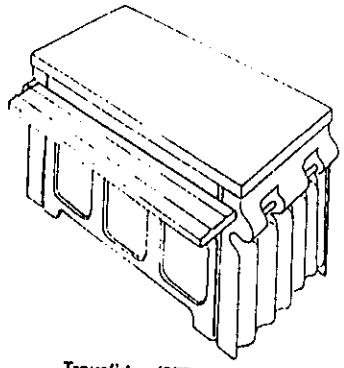
# Galley® Line

## Sanitary, Heavy-Duty, Scratch Resistant Serving Modules

NOTE - Always Specify Color - Pewter Tan, Dove White or Black Pearl. Basic Galley Modules Do Not Include Accessories.

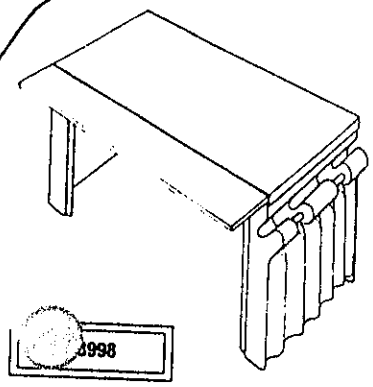
## Accessories



Trayslides (8774 Shown)

| Description | To Fit 28" Width Model | Lbs. | To Fit 50" Width Model | Lbs. | To Fit 64.5" Width Model No. | Lbs. | To Fit 79" Width Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Folding Trayslides:** 11" Solid Stainless Steel, 3-Raised Reinforced Ribs, | Full 28"- Short 20 7/8" | | Full 50"- Short 42 7/8" | | Full 64.5"- Short 57 3/8" | | Full 79"- Short 71 7/8" | |
| Full Length | 8772 | 9 | 8774 | 14 | 8776 | 18 | 8778 | 20 |
| Short Length | 8771 | 8 | 8773 | 13 | 8775 | 17 | 8777 | 19 |
| In Fill 4" x 11" | 8843 | 4 | 8843 | 2 | 8843 | 2 | 8843 | 2 |
| **Corner Trayslides:** | | | | | | | | |
| New! 90° Corner | 8779 | 18 | | | | | | |
| New! 45° Corner Inside | 8770A | 12 | | | | | | |
| 45° Corner Outside | 8770B | 18 | | | | | | |
| For 9428, 36" | 8967 | 12 | | | | | | |
| **Fixed Tray Slide Kit** | 8894 | | 8894 | | 8894 | | 8894 | |
| **Trayslide Height Modification** | 8508 | | 8508 | | 8508 | | 8508 | |

Included at no charge: One port-a-clamp #9000877 for each folding trayslide or three (3) for #8779. Locks adjacent modules. Shoulder Bolts #2021029

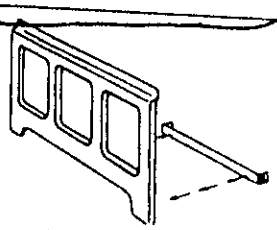


Cutting Boards, Stainless Plate Rests, Extended Tops

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **White Plastic, Folding** 8" Sanitary, Self-Sealing Removable for cleaning. | Full 28"- Short 20 7/8" | | Full 50"- Short 45 7/8" | | Full 64.5"- Short 60 3/8" | | Full 79"- Short 74 7/8" | |
| New! Full Length | 8712 | 15 | 8763 | 27 | 8764 | 33 | 8765 | 38 |
| Short Length | 8664 | 15 | 8665 | 27 | 8666 | 33 | 8667 | 38 |
| For 9428, 36" | 8509 | 18 | | | | | | |
| New! **Stainless Plate Rest:** | | | | | | | | |
| New! Folding 8" Full Length | 8668 | 15 | 8669 | 27 | 8670 | 33 | 8671 | 38 |
| Short Length | 8672 | 15 | 8673 | 27 | 8674 | 33 | 8675 | 38 |
| For 9428, 36" | 8638 | 18 | | | | | | |

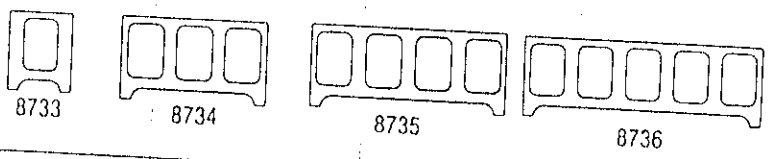
Corners: 90° Corner, 8651; 45° Outside (Long) Corner, 8652; Inner (Short) Corner, 8653. For 3 Directional 36" #8638, in fill 4" x 11" - 8843.

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| New! **Fixed Plate Rest Kit** | 8686 | 0 | 8686 | 0 | 8686 | 0 | 8686 | 0 |
| New! **Open Plate Cupboard** | 8998 | 50 | 8998A | 70 | 8998B | 90 | 8998C | 110 |
| **Extended Top to Create Built In Tray Slide or Plate Rest (each side)** | 8677 | 20 | 8678 | 40 | 8679 | 60 | 8685 | 70 |
| **Portable (NSF), Wood** 12" x 20" x 1 1/2" | 8676 | 10 | 8676 | 10 | 8676 | 10 | 8676 | 10 |

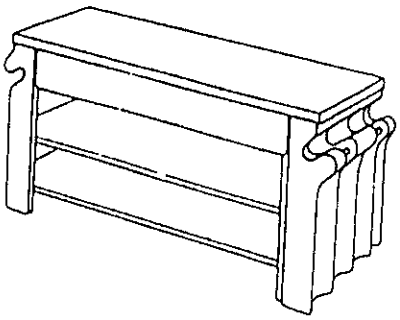


Closure and Access Panel (8734 Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Closure and Access Panel For Server's Side** - Removable without tools. | 8733 | 12 | 8734 | 15 | 8735 | 20 | 8736 | 25 |



8733 8734 8735 8736



Undershelf (2 Shown)
Interior Stainless End Liners (Not Shown)

| Description | Model | Lbs. | Model | Lbs. | Model No. | Lbs. | Model No. | Lbs. |
|---|---|---|---|---|---|---|---|---|
| **Undershelf** - All modules except salad bars | 8756 | 9 | 8757 | 15 | 8758 | 20 | 8759 | 24 |
| **Pass Thru Shelves** | 8756PT | 9 | 8757PT | 15 | 8758PT | 20 | 8759PT | 24 |
| **Undershelf**- For refrigerated salad bars: 9240, 9241, 9250, 9251, 9640, & 9650 Shelf is positioned next to compressor. **Note: #9230, #9231, & #9630** cannot accommodate an undershelf. Undershelves not available for corner modules. | Not Available | | Not Available | | 8752 | 15 | 8757 | 15 |
| | | | | | 8752PT | 15 | | |
| **Interior Stainless Steel End Liners (Both Ends)** | 8893 | 15 | 8893 | 15 | 8893 | 15 | 8893 | 15 |
| **Pass-Thru Cabinet Base** Heavy Duty stainless steel walls with two S/S shelves no doors, unheated. | 8620 | 50 | 8621 | 100 | 8622 | 125 | 8623 | 200 |



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# NEW! PACKET RACKS

CARLISLE FoodService Products

#98

Carlisle Packet Racks hold all types of condiment packets, utensils, straws, and napkins in compact units that take up very little counter space. Use front-of-the-house for self service dispensing, back-of-the-house for quick refills, or at wait stations to keep things organized and within easy reach.

- unique containers have a drop-in card holder molded into the front and each unit comes with a set of 31 common label cards for organizing and identifying contents
- for use on counter or mount to wall with screws (included)

**Aluminum Frame**

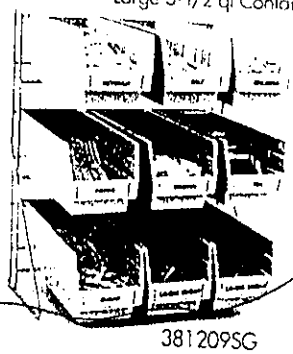
- sturdy frame with rugged plastic containers; available in three sizes

**Wire Frame**

- economical chrome wire frame with durable plastic containers
- single frame holds either 9 ea 2-1/2 qt containers or 6 ea 4 qt containers

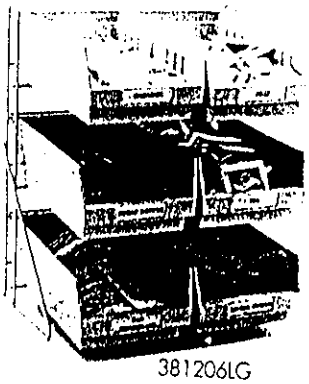
| Prod. No. | Description | Case Pack | Case Wt. Cube | List Price |
|---|---|---|---|---|
| **Aluminum Frame** | | | | |
| 381106LVG | NEW! Packet Rack, holds 6 ea 3-1/2 qt containers | 1 ea | 8.65/2.04 | **162.44 ea** |
| 381109LG | NEW! Packet Rack, holds 9 ea 3-1/2 qt containers | 1 ea | 12.50/2.74 | **209.56 ea** |
| 381112SG | NEW! Packet Rack, holds 12 ea 1 qt containers | 1 ea | 8.10/1.45 | **186.00 ea** |
| **Wire Frame** | | | | |
| 381206LG | NEW! Wire Packet Rack, holds 6 ea 4 qt containers | 1 ea | 7.50/1.35 | **109.56 ea** |
| 381209SG | NEW! Wire Packet Rack, holds 9 ea 2-1/2 qt containers | 1 ea | 8.40/1.35 | **109.56 ea** |
| **Replacement Parts** | | | | |
| 381101SG | NEW! 1 qt Container for 381112SG | 24 ea | 7.00/1.01 | **7.07 ea** |
| 381201SG | NEW! 2-1/2 qt Container for 381209SG | 12 ea | 4.39/0.73 | **6.07 ea** |
| 381101LG | NEW! 3-1/2 qt Container for 381106 & 381109 | 12 ea | 10.00/2.41 | **14.96 ea** |
| 381201LG | NEW! 4 qt Container for 381206LG | 12 ea | 6.35/1.01 | **9.28 ea** |

381109LG
Large 3-1/2 qt Containers



381209SG
Small 2-1/2 qt Containers

381106LVG
Large 3-1/2 qt Containers



381206LG
Large 4 qt Containers

# FOOD STATIONS

## CONDIMENT FOOD STATION

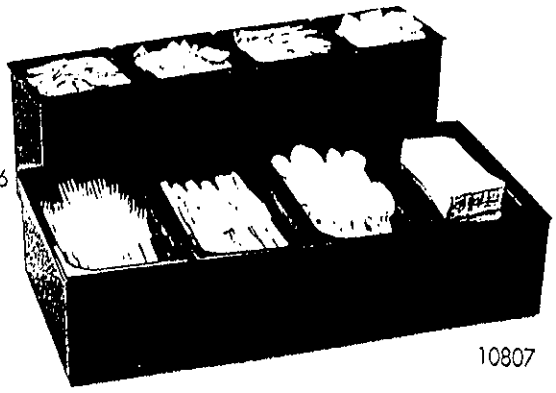
- includes (4) sixth-size 4" deep, Top Notch™ Polycarbonate Black Food Pans
- can also hold (4) sixth-size Coldmaster™ Standard Food Pans (sold separately on page 123)
- **colors: Black(03)**

## MULTI-PURPOSE FOOD STATION

- includes (4) third-size 4" deep, Top Notch™ Polycarbonate Black Food Pans
- can also hold (4) third-size Coldmaster™ Standard Food Pans sold separately on page 123
- **colors: Black(03)**

| Prod. No. | Description | Case Pack | Case Wt. Cube | List Price |
|---|---|---|---|---|
| 10806 | Condiment Food Station | 1 ea | 13.30/4.54 | **140.05 ea** |
| 10807 | Multi-Purpose Food Station | 1 ea | 16.40/4.45 | **173.29 ea** |

10806



10807

See Tech Specs page 74 for additional information

# REPLACEMENT PARTS

#98

| Prod. No. | Description | Case Pack | Case Wt. Cube | List Price |
|---|---|---|---|---|
| 38550SOR | Spout O-Ring for 38550R Pump | 1 ea | 0.01/0.01 | 3.05 ea |
| 38559CSB | Stainless Steel Ball Cock for 38550R Pump | 1 ea | 0.01/0.01 | 6.76 ea |
| 38550PSO | Piston Seal & O-Ring for 38550R Pump | 1 ea | 0.20/0.01 | 14.44 ea |
| 38550SPR | Stainless Steel Spring for 38550R Pump | 1 ea | 0.05/0.01 | 5.33 ea |
| 38550KB | Black Knob for 38550R Pump | 1 ea | 0.10/0.01 | 9.67 ea |
| 38550KR | Optional Red Knob for 38550R Pump | 1 ea | 0.10/0.01 | 9.67 ea |
| 38550KY | Optional Yellow Knob for 38550R Pump | 1 ea | 0.10/0.01 | 9.67 ea |
| **Pump Kits** | | | | |
| 3831038 | Cap Only, 38mm | 12 ea | 0.10/0.01 | 2.51 ea |
| 3831063 | Cap Only, 63mm for oil/shortening containers | 12 ea | 0.45/0.16 | 5.00 ea |

| Prod. No. | Description | Case Pack | Case Wt. Cube | List Price |
|---|---|---|---|---|
| 3831089 | Cap Only, 89mm | 12 ea | 0.45/0.50 | 2.51 |
| 38310105 | Cap Only, 105mm | 12 ea | 0.75/0.11 | 4.58 ea |
| 38310110 | Cap Only, 110mm | 12 ea | 0.70/0.09 | 2.51 ea |
| 38310110S | Cap Only, 110mm snap-fit cap | 12 ea | 1.10/0.09 | 3.36 ea |
| 38310120 | Cap Only, 120mm | 12 ea | 0.85/0.12 | 2.51 ea |
| 38310160 | Cap Only, 160mm snap-fit cap for #10 cans | 12 ea | 0.35/0.13 | 4.22 ea |
| **Squeeze Bottles** | | | | |
| 3860C | Cap (Cap only) | 12 ea | 0.20/0.05 | 0.71 ea |
| 3860T | Spout Tip (Tip only) | 12 ea | 0.15/0.05 | 0.47 ea |
| 3860S | Optional 1 Piece Cap & Spout | 12 ea | 0.25/0.05 | 0.96 ea |

# TECH SPECS

## CUP DISPENSERS

shown on page 52 — Material: 18-8 Stainless Steel

| Product Number | Length | Diameter |
|---|---|---|
| **Elevated Dispensers** | | |
| 38820ECP | 23.00 | 3.50 |
| 38820ECF | 23.00 | 3.50 |
| 38830ECP | 23.00 | 4.00 |
| 38830ECF | 23.00 | 4.00 |
| 38840ECP | 23.00 | 5.13 |
| **Gravity Feed Dispensers** | | |
| 38815C | 17.00 | 3.00 |
| 38820C | 23.00 | 3.50 |
| 38830C | 23.00 | 4.00 |
| 38840C | 23.00 | 5.13 |

## HANGING LID DISPENSERS

shown on page 52 — Material: 18-8 Stainless Steel

| Product Number | Length | Diameter |
|---|---|---|
| 38825L | 18.00 | 3.50 |
| 38825LTT | 18.00 | 3.50 |
| 38835L | 18.00 | 4.00 |
| 38835LTT | 18.00 | 4.00 |
| 38845L | 18.00 | 5.13 |
| 38845LTT | 18.00 | 5.13 |

## COUNTER TOP HOLDERS

shown on page 53 — Material: 18-8 Stainless Steel

| Product Number | Length | Base Width/ Diameter | Height |
|---|---|---|---|
| 38820H | 12.00 | 14.00 | 24.00 |
| 38809H | — | 12.00 | 22.00 |
| 38810H | — | 12.00 | 22.00 |

## LID & STRAW DISPENSERS

shown on page 53 — Material: 18-8 Stainless Steel

| Product Number | Length | Width | Height |
|---|---|---|---|
| 388804RL | 8.50 | 8.50 | 7.50 |
| 388804L | 16.00 | 4.50 | 6.60 |
| 388806L | 23.50 | 4.50 | 6.60 |

## ADJUSTABLE DRINK CUP DISPENSERS

shown on page 54 — Material: 18-8 Stainless Steel

| Product Number | Length | Width/ Diameter | Height |
|---|---|---|---|
| 38882G | 25.00 | 7.00 | 14.00 |
| 38883G | 25.00 | 7.00 | 21.88 |
| 38884G | 25.00 | 7.00 | 29.13 |
| 38884GS | 25.00 | 14.00 | 14.88 |
| 38850GEW | 23.75 | 6.75 | — |
| 38BEZBLK | — | 6.75 | — |
| 38BEZBLU | — | 6.75 | — |
| 38BEZRED | — | 6.75 | — |
| 38BEZWHT | — | 6.75 | — |

## LID & CONDIMENT ORGANIZER

shown on page 54 — Material: 18-8 Stainless Steel

| Product Number | Length | Width | Height |
|---|---|---|---|
| 38800GLC | 25.00 | 7.00 | 6.63 |

## PACKET RACKS

shown on page 55 — Material: Anodized Aluminum, Chrome Plated Steel*

| Product Number | Length | Width | Height |
|---|---|---|---|
| 381106LVG | 12.00 | 12.00 | 19.00 |
| 381109LG | 18.00 | 12.00 | 19.00 |
| 381112SG | 14.00 | 8.00 | 19.00 |
| 381206LG* | 14.00 | 12.00 | 18.00 |
| 381209SG* | 14.00 | 12.00 | 18.00 |

## FOOD STATIONS

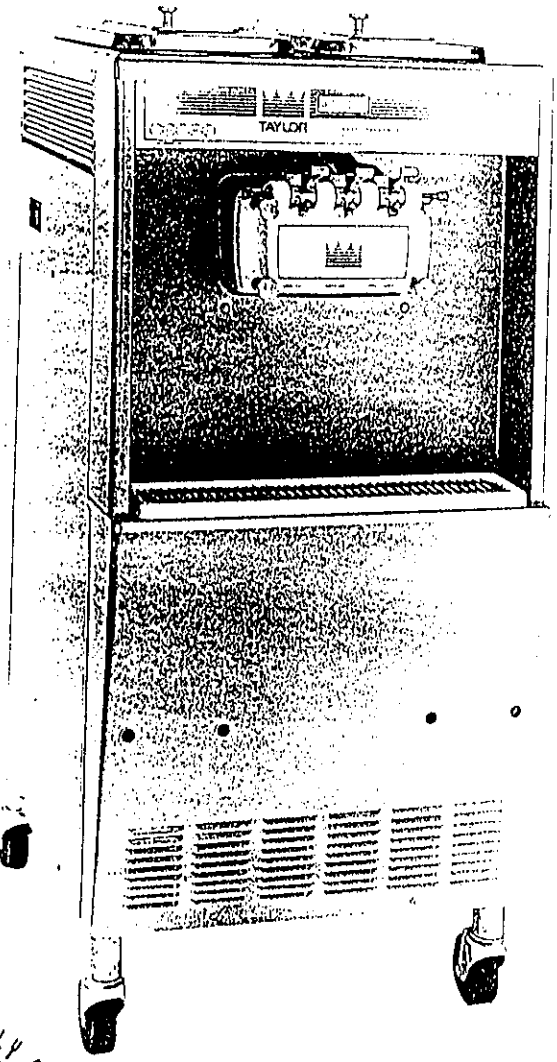
shown on page 55 — Material: Shell – Acrylic, Pans – Polycarbonate

| Product Number | Length | Width | Height |
|---|---|---|---|
| 10806 | 25.25 | 6.50 | 8.75 |
| 10807 | 27.25 | 12.25 | 6.25 |

#101

Model

# H84/PH84

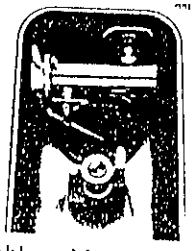



This twin twist soft serve freezer is part of the Universe Series which combines the latest research and development in a heat treatment process.

The Model H84 is designed to provide a safe, sanitary environment, yet reduce the tiresome task of daily cleaning. The revolutionary heat treatment system provides a unique, timed heating and cooling system which safely maintains the product up to two weeks before a routine cleaning is required.

The Model H84 is the safe, sanitary way to offer all the popular soft serve variations like low fat and no fat ice creams and yogurt.

Increase your sales and multiply your profits with the Taylor Model H84.



Also available as Model PH84 with In-Hopper Air/Mix Pump

TAYLOR®

Taylor world-wide distributor network offers the most complete equipment, factory trained service technicians, full parts ory, merchandising programs, financing, and leasing capabilities eet your needs. Your local distributor is a Taylor professional who can assist in planning your profit potential.

To project your own profit potential, use the chart provided.

| SOFT SERVE | | Your Figures |
|---|---|---|
| Selling price | | |
| Less food cost | – | |
| Profit | | |
| Multiply servings per day | X | |
| Profit per day | | |
| Multiply days open per year | X | |
| Profit per year | | |

Model

# H84/PH84

## EATURES

**reezing Cylinder**
wo, 3.4 quart (3.2 liter) cylinders r fast and steady production.

**lix Hopper**
wo, 20 quart (18.9 liter) capacity ppers. The insulated hoppers are frigerated during normal and andby operation to maintain the ix below 41°F (5°C).

**dicator Lights**
warning light flashes alerting the perator of insufficient mix level. 'hen the mix out light flashes, the nit is automatically placed in the Standby" mode, protecting the eezer from damage.

**lectronic Controls**
ne software in the Universal ontrol is programmed to monitor l modes of operation. Product scosity is continually measured to sure consistent quality at all nes.

**ower Interrupt and Lock-out**
his computer based safety feature programmed to alert the operator product reaches unsafe mperatures as a result of power ss. If Heat Treatment features e improperly used, the unit tomatically locks all freezer nctions until proper measures e taken to ensure health codes e met.

**CD Readout**
o assure proper performance, the CD (Liquid Crystal Display) adout will identify temperatures the hopper or freezing cylinder at ny point of operation. This feature an also provide history of mperatures and times during the st 13 heat treatment cycles.

**horough Agitation**
roduct is continually agitated in ne hopper during the heat eatment cycle, and as necessary to naintain the mix below 41°F (5°C) "Auto" or "Standby."

**n-Hopper Air/Mix Pump**
umps (available as Model PH84) re located in the hoppers to naintain product quality and verrun at desired levels.

## OPTIONS

- Cone Dispenser
- Faucet
- Draw Valve Lock Kit
- Panel Spinner

Consult your local Taylor distributor for availability of these options. All options may not be available in combination with others.

## SPECIFICATIONS

**Beater Motor**
Two, 1.5 hp.

**Refrigeration Unit**
Two, approximately 9,500 btu/hr compressors. (BTU's may vary based on compressor used.) R404A.

**Air Cooled**
Clearance: 3" (7.6 cm.) around all sides. A deflector has been added to underside preventing recirculation of warm air. This will assure proper air flow across condensers to obtain optimum performance.

| Model H84 | One dedicated connection | |
|---|---|---|
| Electrical | Maximum Fuse Size | Minimum Circuit Ampacity |
| 208-230/60/1 Air | [illegible] | 47 |
| 208-230/60/1 Water | 50 | [illegible] |
| 208-230/60/3 Air | [illegible] | [illegible] |
| 208-230/60/3 Water | 40 | 31 |

| Model PH84 | One dedicated connection. | |
|---|---|---|
| Electrical | Maximum Fuse Size | Minimum Circuit Ampacity |
| 208-230/60/1 Air | 65 | 53 |
| 208-230/60/1 Water | 50 | 47 |
| 208-230/60/3 Air | 45 | 37 |
| 208-230/60/3 Water | 45 | 34 |

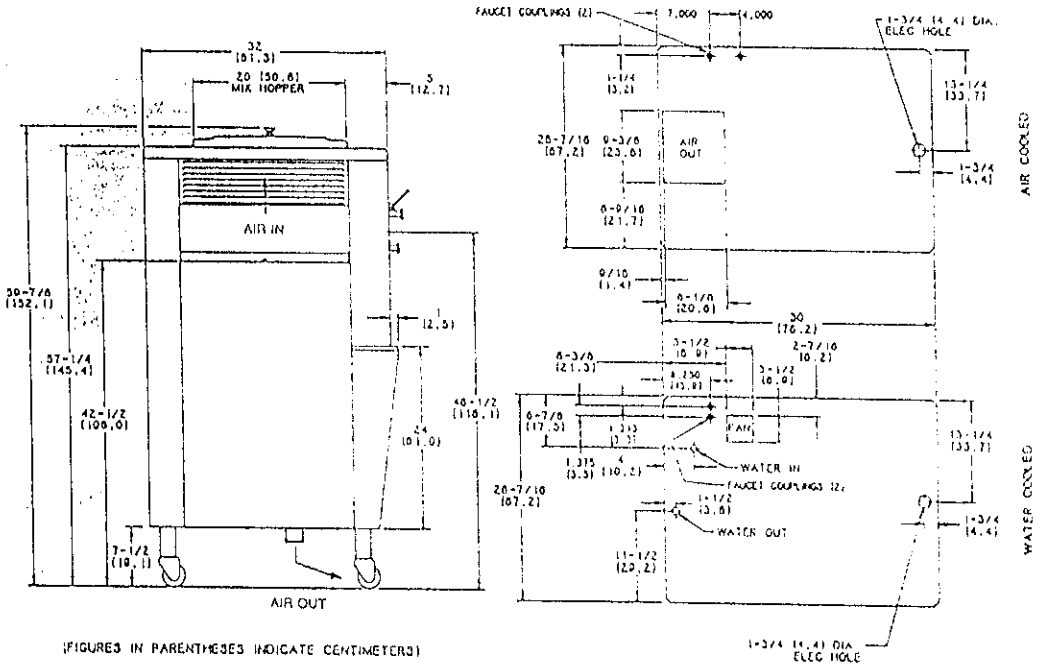
This unit is manufactured in other electrical characteristics. Refer to the Distributor Data Book for availability. (For exact electrical information, always refer to the data label of the unit.)

**Water Cooled**
Water inlet and drain connections under side of base 1/2" FPT.

**Dimensions**
Width: 26-7/16" (67.2 cm.)
Depth: 33" (83.8 cm.)
Height: 59-7/8" (152.1 cm.)
Floor Clearance: 7-1/2"(19.1 cm.) mounted on standard casters.

**Approximate Weights:**
Model H84
Net: 780 lbs. (353.8 kgs.)
Crated: 870 lbs. (394.8 kgs.)
Model PH84
Net: 849 lbs. (385.1 kgs.)
Crated: 939 lbs. (425.9 kgs.)
48.1 cu. ft. (1.3 cu. m.)

Availability and specifications subject to change without notice.




(FIGURES IN PARENTHESES INDICATE CENTIMETERS)


Taylor Company
Rockton, Illinois 61072
[illegible] 255 0626


Standard 6 SA2650 Selected 50 Hz Models


[illegible] ADV 6/96

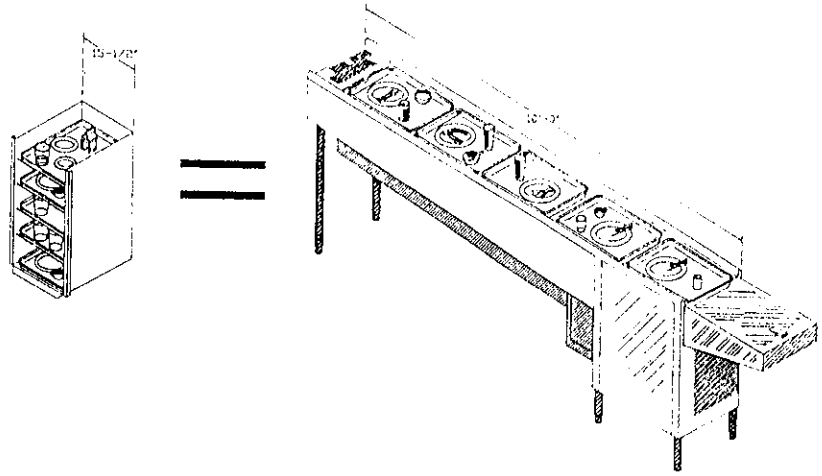
Stero

QUALITY, SERVICE, INNOVATION
SINCE 1945

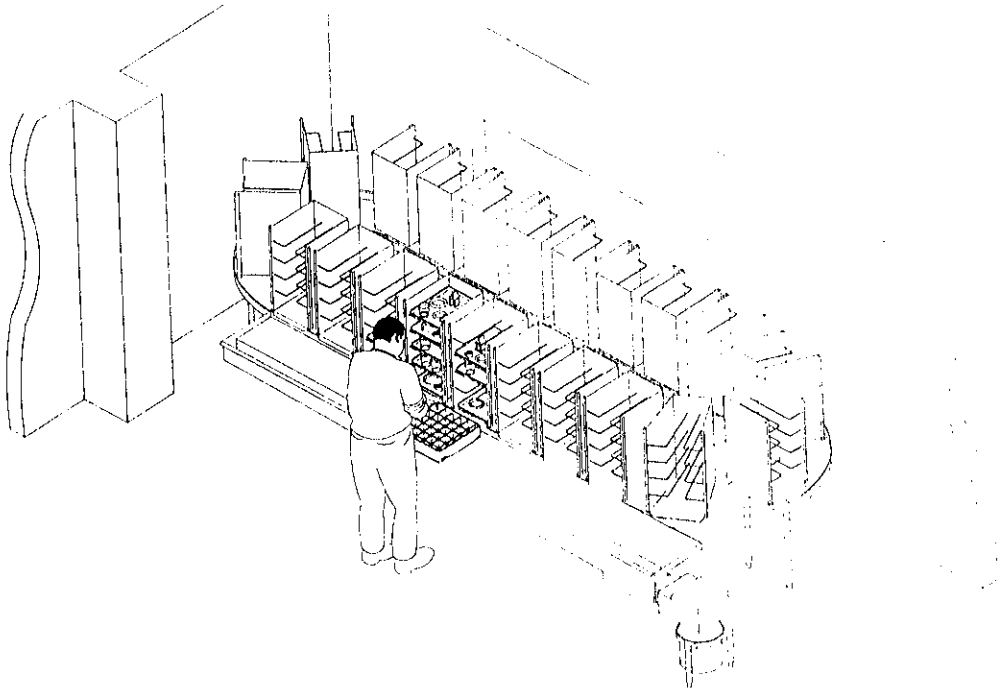
*SUPERIOR DISHWASHING SYSTEMS*

ITEM #102

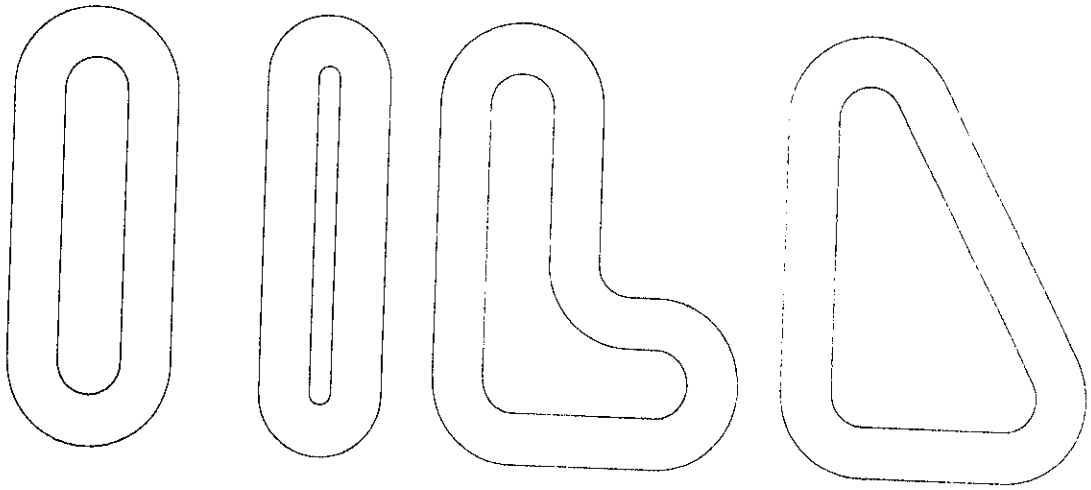
# THE STERO STAC
## SOILED TRAY ACCUMULATING CONVEYOR



One 15½ inch tray carrier is equal to approximately 10 feet of conventional soiled tray conveyor.



An optional scrapping trough can be added to any STAC unit. The one pictured accommodates a 20x20 inch rack for loading glasses, utensils and other rackable items. The scrapping trough can be connected to a disposer, hommel pot, compactor or a pulper.



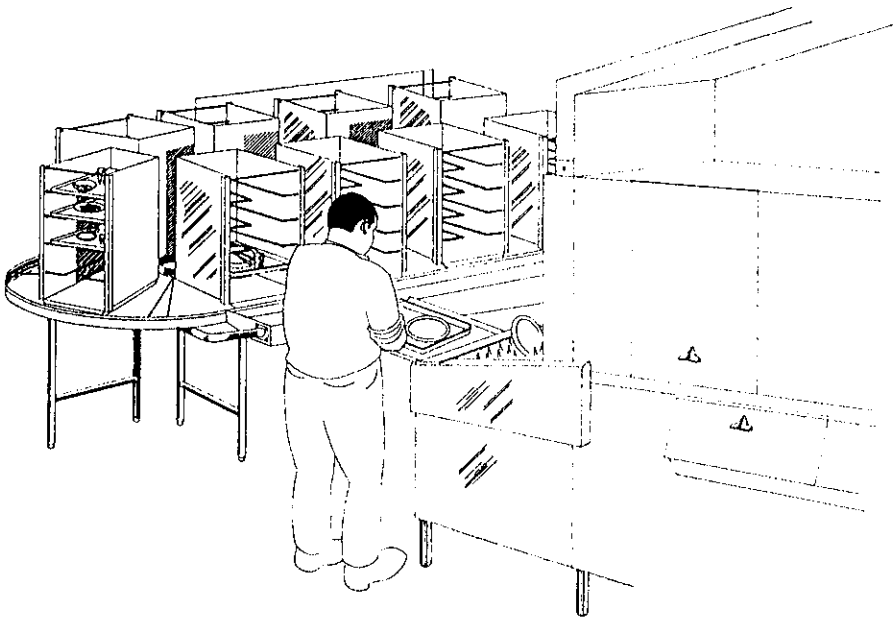
The STAC can be manufactured in many configurations to fit a particular layout. Call a trained representative or the factory for suggestions and floor plans.

The STERO STAC Tray Accumulating System offers a truly revolutionary and yet practical alternative to conventional tray conveyor systems.

The STAC is a self-bussing system that accommodates five times more trays than a conventional flat belt conveyor because the trays are vertically loaded in STERO's unique five tiered carrier. The STAC eliminates tray pile-up at the load and unloading points because the trays are randomly placed and removed on the carriers which are in turn conveyed around the system. Breakage is greatly reduced because of the STAC's smooth riding design and ease of loading and unloading.

The STAC is a true accumulator. Depending on the unit's size, it can be turned on and left to accumulate trays while the dishroom staff can be employed at other tasks.

The STAC is loaded by dining room patrons through a pass-through window, usually located near the dining room exit.

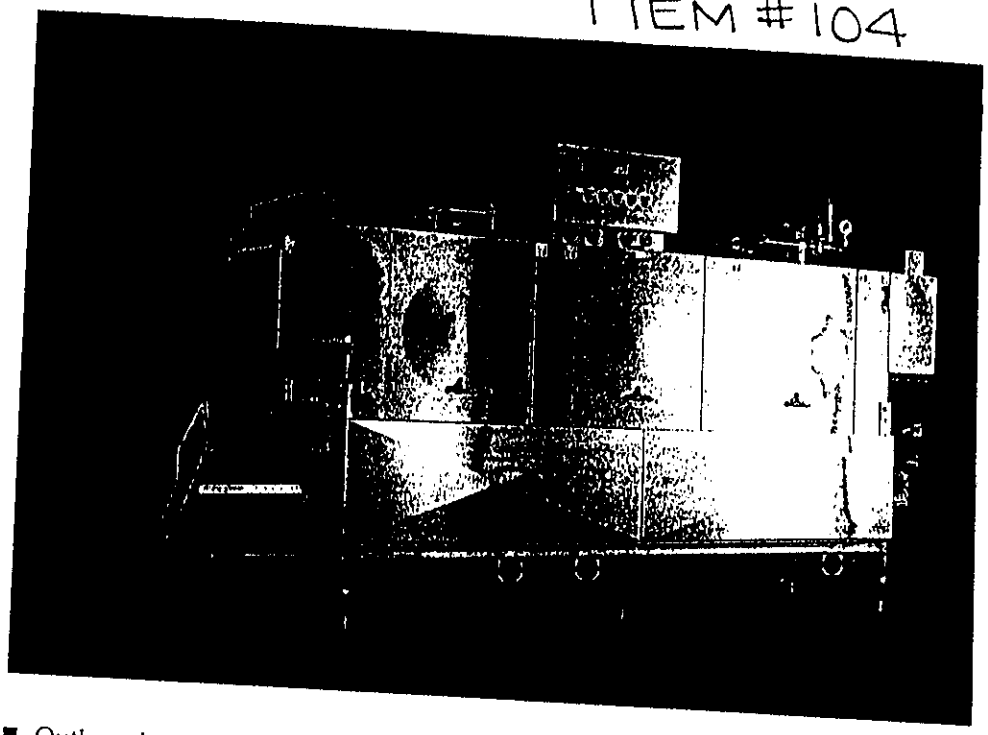


The STAC to machine transition is made easy with a sorting bridge and optional scrapping trough. The operator can work at his own pace as missed trays are conveyed around the accumulator for another

# SCT-94S
# SCT-108S
# SCT-120S

ITEM #104

*Stero's maximum capacity three tank conveyor ware washers. Three models to choose from.*



### Complete High Volume Performance in a Straight Through Conveyor

- Each machine has a separate scrapper, wash and rinse tank with a final rinse.
- Each tank independently sprays 185 to 300 gallons of concentrated recirculated water over the ware per minute, depending on the model number.
- Produces 247 to 308 racks of clean ware per hour, depending on the model number.

### Designed for Easy Operation

- Racks are conveyed through the washer by Stero's own stainless steel center driven pawl system.
- The operator advances the loaded rack of ware through flexible strip curtains to begin the automatic conveyance of the ware through the scrapping, wash, rinse and final rinse sections.

### Power Scrapping Eliminates Pre-Rinsing

- The power scrapper pre-cleans the ware 185 to 300 gallons of concentrated water per minute (depending on the model number) thus eliminating an entire dishroom task.
- Automatically scrapped soil is flushed over inclined scrap screens into an outboard scrap catchment.
- Outboard scrap catchment can be cleaned from the exterior of the machine while it remains in full operation.
- Expended final rinse water is piped to the scrapper section to be recycled.
- Power scrapping reduces detergent consumption.

### Unique Power Wash and Rinse

- Stero's unique stricture free center fed manifolds evenly distribute 225 to 300 gallons (depending on the model number) of recirculated wash water over the ware per minute.
- Center fed manifolds are easy to remove, easy to clean and require no tools.
- Unique Stero end caps easily unscrew by hand.
- Stainless steel strainer pans efficiently filter recirculated water.
- Easy to read temperature gauges monitor all tank temperatures.

### High or Low Temperature Final Rinse

- Both are automatically activated only when a rack passes through the final rinse section.
- High temperature final rinse distributes 3.76 to 4.53 gallons (depending on model number) of 180 degree water over ware per minute.
- These machines are also available in a low temperature 140 degree final rinse CSA model by specifying an optional Stero chlorine dispenser.
- Low temperature final rinse eliminates the need for a hot water booster heater.

*(continued...)*

Stero

*The Stero Company*
*3200 Lakeville Highway ■ Petaluma, CA 94954-5675*
*■ Toll Free 800-762-7600*

### *Standard Safety Features*

- Door safety switches prevent the machine from operating unless the doors are fully closed.
- Conveyor release housing will prevent damage to the machine and ware in the event of jamming.

### *Standard Features Engineered for the End User*

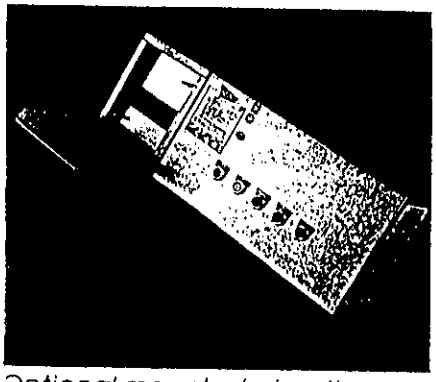
- Type 304, 18-8, #4 stainless steel tank and hood.
- Stainless steel frame and legs.
- Enclosed adjustable stainless steel feet.
- Stainless steel strainer pans cover tank and efficiently filter recirculated water.
- 2 HP drip-proof pump motor with overload protection, extended shafts, sealed ball bearings and manual reset buttons.
- 1/4 HP conveyor drive motor.
- Self draining centrifugal pump with removable inspection plates.
- Durable poppet drain valve has replaceable parts.
- All machines are completely inter-plumbed and wired.

### *Tank Heat Options — Choose One*

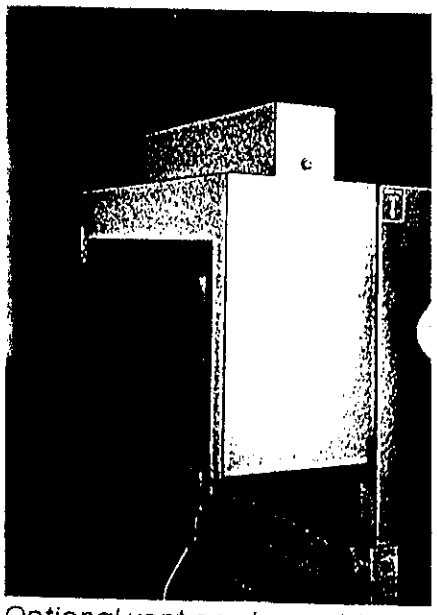
- Infrared gas tank heat thermostatically controlled and is equipped with low water cut-off.
- Electric tank heat, thermostatically controlled and is equipped with low water cut-off.
- Steam injectors, thermostatically controlled and equipped with steam silencers and low water cut-off.
- Steam coils, thermostatically controlled, provide for a completely closed heating system and are equipped with low water cut-off.

### *Miscellaneous Options*

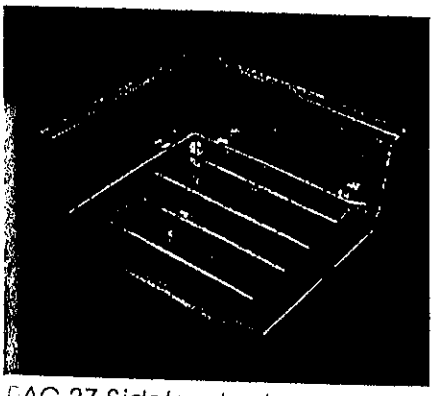
- Kit #55, a complete plumbing system installed that contains a pressure reducing valve, shock arrester and a flow pressure gauge.
- Auto Shut Down device starts the machine when racks enter and shuts the unit off if no racks are being washed.
- RAC-27 sideloader converts conveyor machines to a corner load application.
- Chlorine dispenser, completely installed and plumbed.
- Common drain provides a single 2 inch waste connection.
- Stainless steel front enclosure panel.
- Vent cowls with adjustable damper.
- Low pressure steam package available for applications where steam pressure falls below 15 PSI.



*Optional mounted circuit breakers provide a single point connection.*

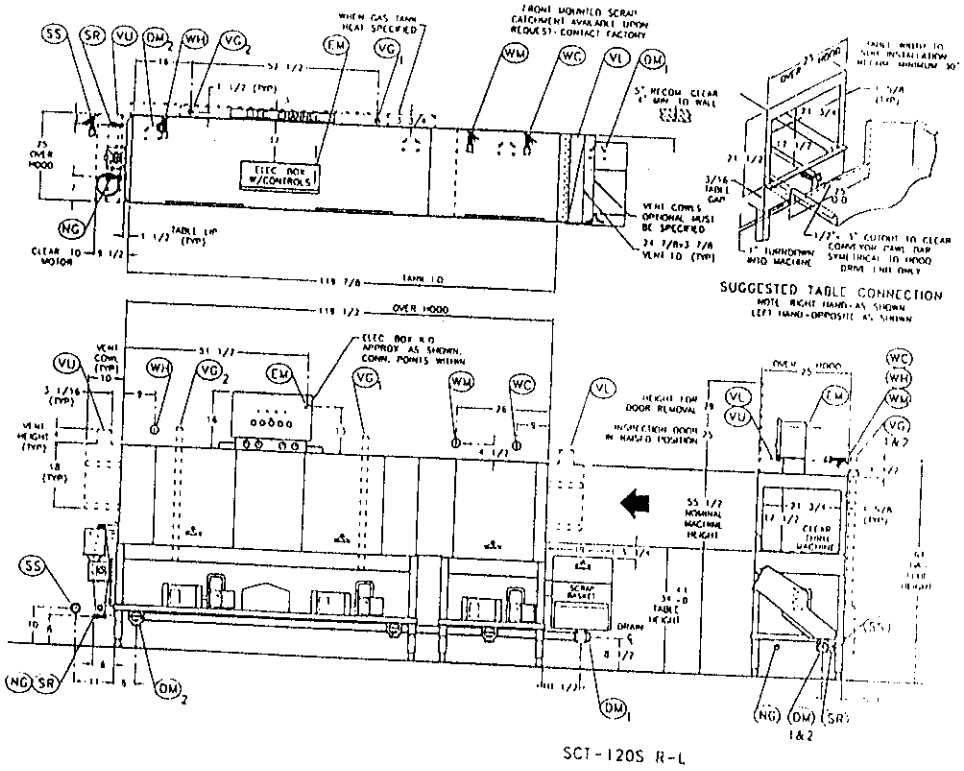


*Optional vent cowls provide efficient ducting of steam and excess heat.*



*RAC-27 Sideloader transforms a straight through machine into a space saving corner model.*

ITEM # 104




SCT-120S R-L

## SCT-120S

### STEAM TANK HEAT

| PTS. | SIZE | DESCRIPTION |
|---|---|---|
| DM | 2" NPT (F) | DRAIN MACHINE WASTE (LEAVE UNUSED POINT PLUGGED) |
| WC | 3/4" NPT (F) | WATER SUPPLY COLD AS AVAILABLE |
| WM | 3/4" NPT (F) | WATER SUPPLY 140 MIN TANK INLET |
| WH | 3/4" NPT (F) | WATER SUPPLY 180°F MIN @ 20 PSI FLOW RATE CONSUMPTION = 222 GALS/HR |
| SS | 1" NPT (F) | STEAM SUPPLY 15-40 PSI CONSUMPTION @ 20 PSI FLOW RATE 140 LBS/HR |
| SR | 3/4" NPT (F) | STEAM RETURN |
| EM | ELECTRICAL REQ | ONE (1) WIRE FEEDER SIZED FOR<br>1 SCRAPPER PUMP MOTOR - - - 2HP<br>2 WASH PUMP MOTOR - - - - 3HP<br>3 RINSE PUMP MOTOR - - - 2HP<br>4 CONVEYOR MOTOR - - - 1/2HP |
| VL | NOTED | VENT, LOAD END RECOM MIN DRAW = 200 CFM |
| VU | NOTED | VENT, UNLOAD END RECOM MIN DRAW = 400 CFM |

STANDARD 208V/230V/240V - 50HZ - 60HZ AVAILABLE
CONTACT FACTORY FOR 380V & 50HZ APPLICATIONS
NOTE WC APPLIES ONLY WHEN COLD WATER AQUASTAT SPECIFIED

### GAS TANK HEAT

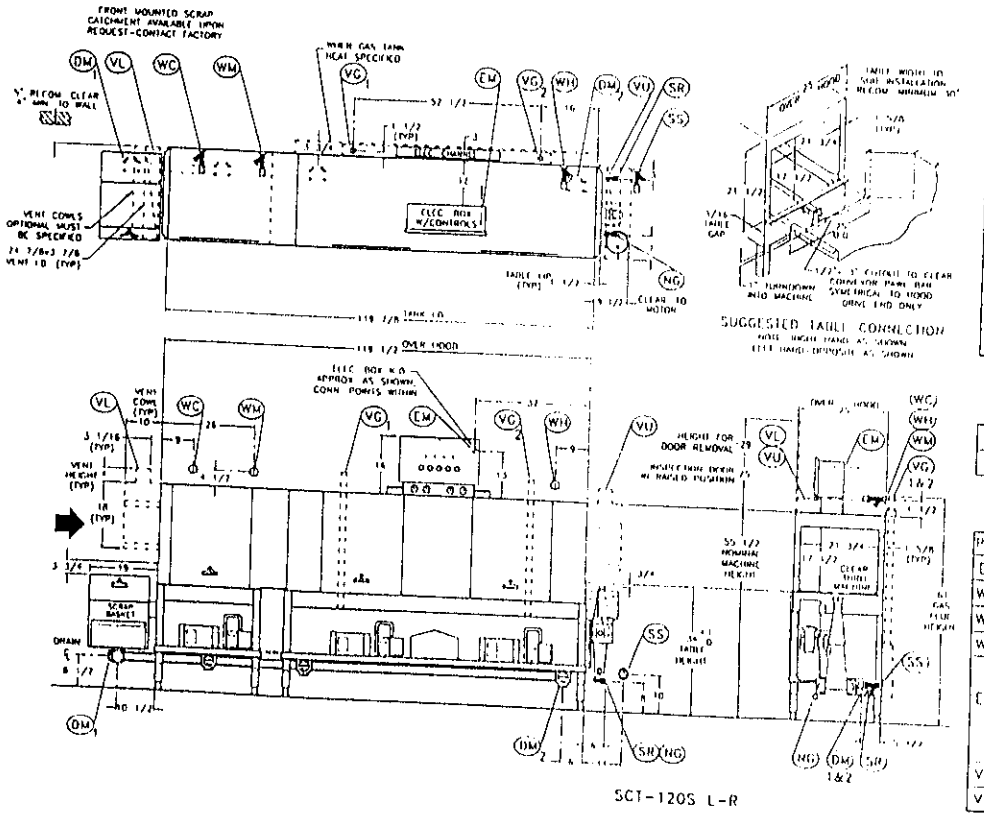
| | | |
|---|---|---|
| NG | 3/4" NPT (F) | NATURAL GAS SUPPLY CONSUMPTION = 92,000 BTU/HR |
| VG 1&2 | 1 5/8" O.D. PIPE | VENT, NATURAL GAS FLUE VENT TO ATMOSPHERE WITH 6HR CAP |

WHEN MACHINES GAS SPECIFIED USE THE CONNECTION IN LIEU OF 1" & 3/4"

### ELECTRIC TANK HEAT

| PTS. | SIZE | DESCRIPTION |
|---|---|---|
| DM | 2" NPT (F) | DRAIN MACHINE WASTE (LEAVE UNUSED POINT PLUGGED) |
| WC | 3/4" NPT (F) | WATER SUPPLY COLD AS AVAILABLE |
| WM | 3/4" NPT (F) | WATER SUPPLY 140 MIN TANK INLET |
| WH | 3/4" NPT (F) | WATER SUPPLY 180°F MIN @ 20 PSI FLOW RATE CONSUMPTION = 222 GALS/HR |
| EM | ELECTRICAL REQ | TWO (2) WIRE FEEDER SIZED FOR<br>1 SCRAPPER PUMP MOTOR - - - 2HP<br>2 WASH PUMP MOTOR - - - - 3HP<br>3 RINSE PUMP MOTOR - - - 2HP<br>4 CONVEYOR MOTOR - - - 1/2HP<br>ELEC. HEATER TANK HEAT - - - 6KW<br>ELEC. HEATER TANK HEAT - - - 6KW |
| VL | NOTED | VENT, LOAD END RECOM MIN DRAW = 200 CFM |
| VU | NOTED | VENT, UNLOAD END RECOM MIN DRAW = 400 CFM |

ALL MACHINES AVAILABLE AS LOW FLOW WATER CONSUMPTION MODELS WHICH PRODUCE 125 RACKS PER HOUR AT 120 GALLONS PER HOUR FINAL RINSE WATER CONSUMPTION




SCT-120S L-R

## SCT-120S

### STEAM TANK HEAT

| PTS. | SIZE | DESCRIPTION |
|---|---|---|
| DM | 2" NPT (F) | DRAIN MACHINE WASTE (LEAVE UNUSED POINT PLUGGED) |
| WC | 3/4" NPT (F) | WATER SUPPLY COLD AS AVAILABLE |
| WM | 3/4" NPT (F) | WATER SUPPLY 140 MIN TANK INLET |
| WH | 3/4" NPT (F) | WATER SUPPLY 180°F MIN @ 20 PSI FLOW RATE CONSUMPTION = 222 GALS/HR |
| SS | 1" NPT (F) | STEAM SUPPLY 15-40 PSI CONSUMPTION @ 20 PSI FLOW RATE 140 LBS/HR |
| SR | 3/4" NPT (F) | STEAM RETURN |
| EM | ELECTRICAL REQ | ONE (1) WIRE FEEDER SIZED FOR<br>1 SCRAPPER PUMP MOTOR - - - 2HP<br>2 WASH PUMP MOTOR - - - - 3HP<br>3 RINSE PUMP MOTOR - - - 2HP<br>4 CONVEYOR MOTOR - - - 1/2HP |
| VL | NOTED | VENT, LOAD END RECOM MIN DRAW = 200 CFM |
| VU | NOTED | VENT, UNLOAD END RECOM MIN DRAW = 400 CFM |

STANDARD 208V/230V/240V - 50HZ - 60HZ AVAILABLE
CONTACT FACTORY FOR 380V & 50HZ APPLICATIONS
NOTE WC APPLIES ONLY WHEN COLD WATER AQUASTAT SPECIFIED

### GAS TANK HEAT

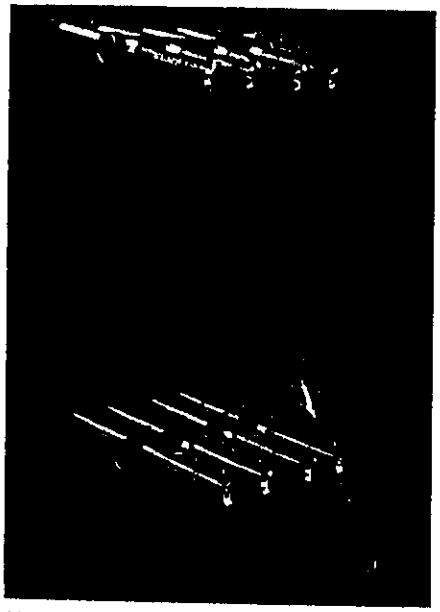
| | | |
|---|---|---|
| NG | 3/4" NPT (F) | NATURAL GAS SUPPLY CONSUMPTION = 92,000 BTU/HR |
| VG 1&2 | 1 5/8" O.D. PIPE | VENT, NATURAL GAS FLUE VENT TO ATMOSPHERE WITH 6HR CAP |

WHEN MACHINES GAS SPECIFIED USE THE CONNECTION IN LIEU OF 1" & 3/4"

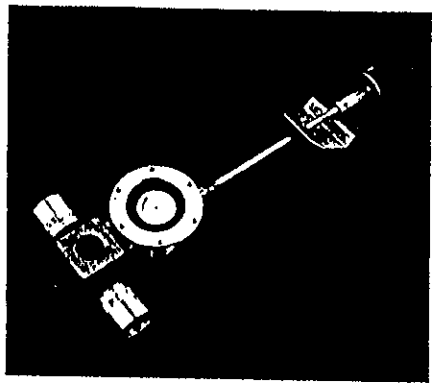
### ELECTRIC TANK HEAT

| PTS. | SIZE | DESCRIPTION |
|---|---|---|
| DM | 2" NPT (F) | DRAIN MACHINE WASTE (LEAVE UNUSED POINT PLUGGED) |
| WC | 3/4" NPT (F) | WATER SUPPLY COLD AS AVAILABLE |
| WM | 3/4" NPT (F) | WATER SUPPLY 140 MIN TANK INLET |
| WH | 3/4" NPT (F) | WATER SUPPLY 180°F MIN @ 20 PSI FLOW RATE CONSUMPTION = 222 GALS/HR |
| EM | ELECTRICAL REQ | TWO (2) WIRE FEEDER SIZED FOR<br>1 SCRAPPER PUMP MOTOR - - - 2HP<br>2 WASH PUMP MOTOR - - - - 3HP<br>3 RINSE PUMP MOTOR - - - 2HP<br>4 CONVEYOR MOTOR - - - 1/2HP<br>ELEC. HEATER TANK HEAT - - - 6KW<br>ELEC. HEATER TANK HEAT - - - 6KW |
| VL | NOTED | VENT, LOAD END RECOM MIN DRAW = 200 CFM |
| VU | NOTED | VENT, UNLOAD END RECOM MIN DRAW = 400 CFM |

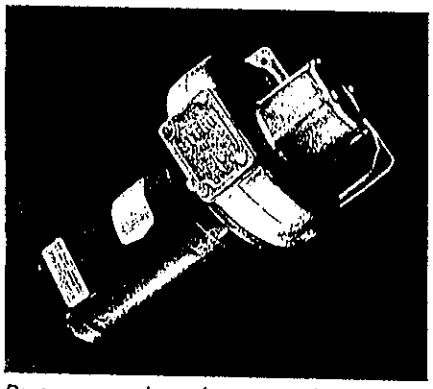
ALL MACHINES AVAILABLE AS LOW FLOW WATER CONSUMPTION MODELS WHICH PRODUCE 125 RACKS PER HOUR AT 120 GALLONS PER HOUR FINAL RINSE WATER CONSUMPTION



*Unique center feed manifolds are easy to remove and maintain without tools.*



*Stero's poppet drain valve has replaceable internal parts.*



*Pumps and motors are integral. They have packless ceramic seals and extended stainless steel shafts.*

The Stero Company
3200 Lakeville Hwy., Petaluma, CA 94954-5675
TEL # (707) 762-3071 TELE-FAX # (707) 762-5036
TOLL FREE (800) 762-7600

| Type of Machine | | Conveyor | Traywashers | |
|---|---|---|---|---|
| | | Three-Tank Corner Loading Power Scrapper, Wash, Rinse and Final Rinse | High & Low Temperature Conveyorized Traywashers | |
| | MODEL NO. | SCT-120SC | STW-74 | STW-110 |
| Capacity Rating (Mechanical) | Racks per Hour | 432 | Traywashers have a variable speed conveyor drive 864 trays/hr. (20" tray) | |
| | Conv. Speed | 11 | | |
| | Dishes per Hour | 7776 | | |
| | Glasses per Hour | 15552 | | |
| Floor Space | Length Between Tables | 120" | 74" | 110" |
| Motor Horsepower | Scrapper Motor | 1 | | 2 |
| | Wash Tank Motor | 2 | 2 | 2 |
| | Rinse Tank Motor | 2 | | |
| | Conveyor Motor | 1/4 | 1/2 | 1/2 |
| Tank Capacity (Gallons) | Scrapper | 20 | | 20 |
| | Wash | 25 | 30 | 30 |
| | Rinse | 25 | | |
| Pump Capacity (Gal. per Min.) | Scrapper | 185 | | 185 |
| | Wash | 300 | 300 | 300 |
| | Rinse | 300 | | |
| Heating ɔment | Steam Injectors | 140lb./hr. | 75lb./hr. | 75lb./hr. |
| | Steam Coils | 140lb./hr. | 75lb./hr. | 75lb./hr. |
| | Gas Burners — BTU (Nat.)(I.R.) | 92,000 BTU/hr. | 92,000 BTU/hr. | 92,000 BTU/hr. |
| | Electric (Wash) | 10KW | 15 KW | 15KW |
| | Electric (Rinse) | 20KW | | |
| ·nse Water Consumed Maximum Gallons per Hour | At 20lb. Flow Press. | 277 | 219 | 219 |
| Rate of Rinse Flow Gal. per Min. | At 20lb. Flow Press. | 4.62 | 3.65 | 3.65 |
| Recommended Booster Size For 40° Rise | Electric | 36KW | 30KW | 30KW |
| | Steam (With 15 PSI Min.) | SWB-260 | SWB-260 | SWB-260 |
| Exhaust C.F.M. | Load End | 200 | 200 | 200 |
| | Unload End | 400 | 400 | 400 |
| Shipping Weight | Approximate | 1875 | 1100 | 1600 |
| Crate Size | Approximate Cubic Feet | 331 | 158 | 225 |
| Crate Size | Approximate | 53 × 142 × 76 | 42 × 86 × 76 | 42 × 122 × 76 |

Model Abbreviation Index

S— Scrapper.
SC— Corner machine with scrapper.
CS— Chemically sanitized and recirculated final rinse.
CSA— Chlorine injection final rinse.
S-CSA— Scrapper and chlorine injection final rinse.
PS— Power scrapper.
D— Blower dryer.

## *Dishwasher Motors (Pumps & Conveyors) Maximum Current Drawn*

| Motor Size | Voltage | Phase | Amps |
|---|---|---|---|
| 1/4 H.P. | 115V | 1 | 4.2 |
| | 208V | 1 | 2.2 |
| | 230V | 1 | 2.1 |
| | 208V | 3 | 1.1 |
| | 230V | 3 | 1 |
| | 460V | 3 | .5 |
| 1/3 H.P. | 115V | 1 | 8.6 |
| | 230V | 1 | 4.3 |
| | 208V | 3 | do not stock |
| | 230V | 3 | do not stock |
| | 460V | 3 | do not stock |
| 1/2 H.P. | 115V DC | 1 | 4.8 |
| 3/4 H.P. | 115V | 1 | 10 |
| | 208V | 1 | 5.5 |
| | 230V | 1 | 5.3 |
| 1 H.P. | 115V | 1 | 13.4 |
| | 208V | 1 | 7.4 |
| | 230V | 1 | 6.7 |
| | 208V | 3 | 3.8 |
| | 230V | 3 | 3.6 |
| | 460V | 3 | 1.8 |
| | 115V DC | 1 | 10 |
| 1-1/2 H.P. | 115V | 1 | 21 |
| | 208V | 1 | 11 |
| | 230V | 1 | 10.5 |
| 2 H.P. | 208V | 3 | 8.5 |
| | 230V | 3 | 6.2 |
| | 460V | 3 | 3.1 |
| 3 H.P. | 208V | 3 | 9 |
| | 230V | 3 | 8.6 |
| | 460V | 3 | 4.3 |

## *Dishwasher Heaters Maximum Current Drawn*

| Size of Heater | Voltage | Phase | Amps |
|---|---|---|---|
| 2000 Watt | 115V | 1 | 17.4 |
| | 230V | 1 | 8.7 |
| | 208V | 3 | 5.6 |
| | 220V | 3 | 5.3 |
| | 480V | 3 | 2.4 |
| 5000 Watt | 230V | 1 | 21.7 |
| | 208V | 3 | 13.9 |
| | 230V | 3 | 12.6 |
| | 480V | 3 | 6.0 |
| 10000 Watt (For 15000 Watt use 10 and 5. For 20000 Watt use 10 and 10.) | 230V | 1 | 43.5 |
| | 208V | 3 | 27.8 |
| | 220V | 3 | 26.3 |
| | 480V | 3 | 12.0 |

## *Electrical Final Rinse Booster Specifications*

| KW | 40 Degree Rise | 70 Degree Rise |
|---|---|---|
| 4 | 41 GPH | 23 GPH |
| 5 | 51 GPH | 29 GPH |
| 6 | 62 GPH | 35 GPH |
| 7 | 72 GPH | 41 GPH |
| 9 | 92 GPH | 53 GPH |
| 12 | 123 GPH | 70 GPH |
| 13.5 | 138 GPH | 79 GPH |
| 15 | 154 GPH | 88 GPH |
| 17.2 | 177 GPH | 101 GPH |
| 18 | 185 GPH | 105 GPH |
| 24 | 246 GPH | 141 GPH |
| 27 | 277 GPH | 158 GPH |
| 30 | 308 GPH | 176 GPH |
| 36 | 369 GPH | 211 GPH |
| 39 | 400 GPH | 229 GPH |
| 45 | 462 GPH | 264 GPH |
| 54 | 554 GPH | 317 GPH |
| 58.5 | 600 GPH | 343 GPH |

*Single Phase*

$$\frac{Watts}{Volts} = Amps$$

*Specify Stero*
*With Mounted Circuit Breakers*

*Three Phase*

$$\frac{Watts}{Volts \times 1.73} = Amps$$

ITEM#

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58

#104a

The Hatco Imperial Electric Booster Water Heater combines quality construction and rugged dependability to provide up to 600 GPH (2300 LPH) of sanitizing rinse water. Dishes and flatware *air-dry* instantly to save time, space and money. Storage capacity is 16 gallons (60 liters).

## FLEXIBILITY

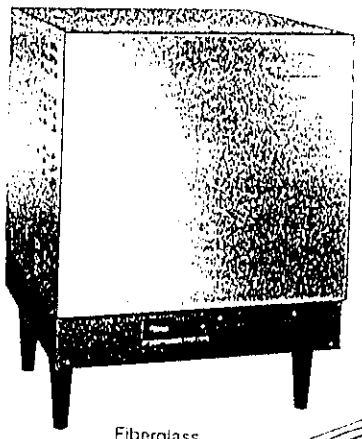
Models available from 6kW to 58.5kW in 208, 240 and 480 volts with other voltages available. The Imperial Electric Booster Heater thermostats can be lowered to a 140°F (60°C) setting for low-temp dishmachines.

Service area is accessible from the front to permit easy installation, even next to other equipment.

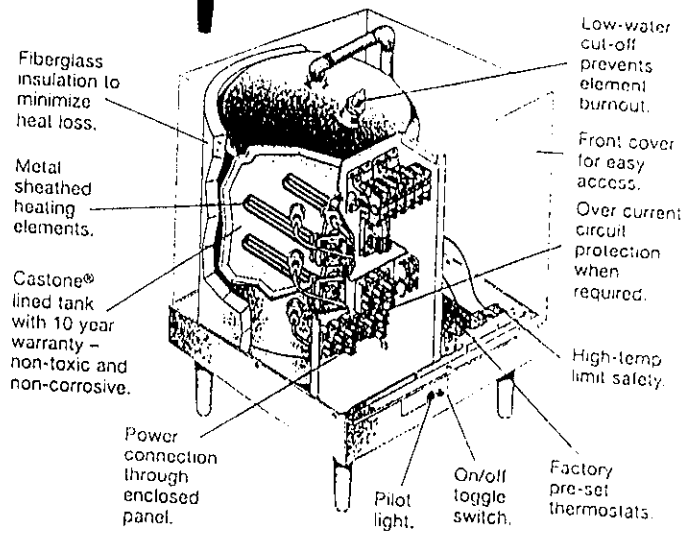
## QUALITY

The following features assure the finest performance for years to come.

- All models include a Castone® lined tank with a 10 year limited warranty.
- Features include a temperature/pressure relief valve, a cast iron pressure reducing valve, two temperature/pressure gauges, a high temperature limit control, pilot indicator light, on-off switch and a low water cut-off to prevent element burnout due to low water condition.
- Each booster has a built-in heat trap and fiberglass insulation to minimize heat loss.
- Low water protection prevents heating element burnout, and alerts operator to low water condition.
- Hatco electric booster heaters are factory pre-plumbed and pre-wired with calibrated immersion thermostats and high temperature limit switch.
- A stainless steel front panel and powder coated silver gray hammertone body is standard on all Imperial models.



Model S-54




Water Temperature Recovery Table

| Imperial Model | 40°F (22°C) Rise | 70°F (39°C) Rise |
|---|---|---|
| S-6 | 60 gph ( 227 lph) | 34 gph ( 129 lph) |
| S-7 | 70 gph ( 265 lph) | 40 gph ( 151 lph) |
| S-9 | 90 gph ( 341 lph) | 52 gph ( 197 lph) |
| S-12 | 120 gph ( 454 lph) | 69 gph ( 261 lph) |
| S-13 | 135 gph ( 511 lph) | 77 gph ( 292 lph) |
| S-15 | 151 gph ( 572 lph) | 86 gph ( 326 lph) |
| S-17 | 173 gph ( 655 lph) | 99 gph ( 375 lph) |
| S-18 | 181 gph ( 685 lph) | 103 gph ( 390 lph) |
| S-24 | 241 gph ( 912 lph) | 138 gph ( 522 lph) |
| S-27 | 271 gph (1026 lph) | 155 gph ( 587 lph) |
| S-30 | 301 gph (1139 lph) | 172 gph ( 651 lph) |
| S-36 | 361 gph (1367 lph) | 206 gph ( 780 lph) |
| S-39 | 391 gph (1480 lph) | 224 gph ( 848 lph) |
| S-40 | 407 gph (1541 lph) | 232 gph ( 878 lph) |
| S-45 | 452 gph (1711 lph) | 258 gph ( 977 lph) |
| S-54 | 542 gph (2052 lph) | 310 gph (1174 lph) |
| S-58 | 588 gph (2226 lph) | 335 gph (1268 lph) |

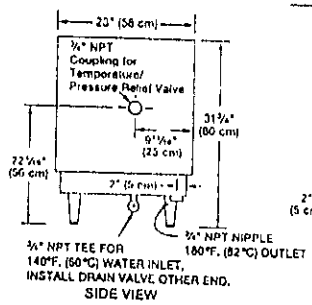
## WATER QUALITY REQUIREMENTS

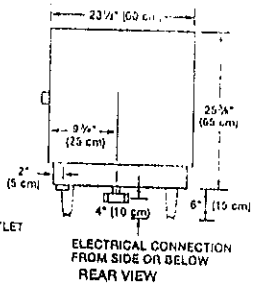
Incoming water in excess of 3.0 grains of hardness per gallon (GPH) (.75 grains of hardness per liter) must be treated and softened before being supplied to booster heater(s). Water containing over 3.0 GPH (.75 GPL) will decrease the efficiency and reduce the operating life of the unit.
*Note: Product failure caused by liming or sediment buildup is not covered under warranty.*

HATCO CORPORATION P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A.
(800) 558-0607 • (414) 671-6350 • Fax (800) 543-7521 • Int'l. Fax (414) 671-2676
Web Site: www.hatco.com

# IMPERIAL ELECTRIC BOOSTER WATER HEATERS

Models S-6, -7, -9, -12, -13, -15, -17, -18, -24, -27, -30, -36, -39, -40, -45, -54, -58




## DIMENSIONS

23½"L x 23"W x 31⅜"H with 6" (15 cm) legs (60 x 58 x 80 cm).

Working Pressure of Tanks: 150 psi (1034 kPa) – tested at 300 psi (2069 kPa).

## VOLTAGE

208, 240 and 480 volts available. Export voltages available.

## SPECIFICATIONS

| Model | kW | Volts | 1-Phase Amps | 1-Phase Breaker/ Fuse Size | 3-Phase Amps | 3-Phase Breaker/ Fuse Size | Shipping Weight |
|---|---|---|---|---|---|---|---|
| S-6* | 6 | 208 | 29 | 40 | 25* | 40 | 200 lbs. (91 kg) |
| | | 240 | 25 | 40 | 22* | 30 | |
| | | 480 | – | – | 11* | 15 | |
| S-7* | 7 | 208 | 34 | 50 | 29* | 40 | 200 lbs. (91 kg) |
| | | 240 | 29 | 40 | 25* | 40 | |
| | | 480 | – | – | 13* | 20 | |
| S-9* | 9 | 208 | 43 | 60 | 38* | 50 | 200 lbs. (91 kg) |
| | | 240 | 38 | 50 | 33* | 50 | |
| | | 480 | – | – | 16* | 20 | |
| S-12 | 12 | 208 | 58 | 90 | 33 | 50 | 200 lbs. (91 kg) |
| | | 240 | 50 | 70 | 29 | 40 | |
| | | 480 | – | – | 14.5 | 20 | |
| S-13 | 13.5 | 208 | 65 | 90 | 38 | 50 | 200 lbs. (91 kg) |
| | | 240 | 56.3 | 90 | 33 | 50 | |
| | | 480 | – | – | 16.3 | 30 | |
| S-15 | 15 | 208 | 72 | 90 | 41.7 | 60 | 200 lbs. (91 kg) |
| | | 240 | 62.5 | 90 | 36.1 | 50 | |
| | | 480 | – | – | 18.1 | 30 | |
| S-17‡ | 17.2 | 208 | – | – | 47.9 | 60 | 200 lbs. (91 kg) |
| S-18§ | 18 | 208 | 86.5 | 125 | – | – | 200 lbs. (91 kg) |
| | | 240 | 75 | 100 | 43.4 | 60 | |
| | | 480 | – | – | 21.7 | 30 | |
| S-24 | 24 | 208 | 115.4 | 150 | 67.7 | 90 | 214 lbs. (97 kg) |
| | | 240 | 100 | 125 | 57.8 | 90 | |
| | | 480 | – | – | 29.9 | 40 | |
| S-27 | 27 | 208 | 129.8 | 175 | 75 | 100 | 214 lbs. (97 kg) |
| | | 240 | 112.5 | 150 | 65 | 90 | |
| | | 480 | – | – | 32.5 | 50 | |

| Model | kW | Volts | 1-Phase Amps | 1-Phase Breaker/ Fuse Size | 3-Phase Amps | 3-Phase Breaker/ Fuse Size | Shipping Weight |
|---|---|---|---|---|---|---|---|
| S-30 | 30 | 208 | 144 | 200 | 83.3 | 125 | 214 lbs. (97 kg) |
| | | 240 | 125 | 175 | 72.3 | 100 | |
| | | 480 | – | – | 36 | 50 | |
| S-36 | 36 | 208 | 173 | 225 | 100 | 125 | 214 lbs. (97 kg) |
| | | 240 | 150 | 200 | 86.7 | 125 | |
| | | 480 | – | – | 43.3 | 60 | |
| S-39 | 39 | 208 | 187.5 | 250 | 108 | 150 | 214 lbs. (97 kg) |
| | | 240 | 163.5 | 225 | 94 | 125 | |
| | | 480 | – | – | 47 | 60 | |
| S-40 | 40.5 | 208 | – | – | 112 | 150 | 224 lbs. (102 kg) |
| | | 240 | – | – | 97 | 125 | |
| | | 480 | – | – | 49 | 60 | |
| S-45* | 45 | 208 | – | – | 125 | 175 | 224 lbs. (102 kg) |
| | | 240 | 188 | 250 | 108 | 150 | |
| | | 480 | | – | 54 | 70 | |
| S-54** | 54 | 208 | – | – | 150 | 200 | 224 lbs. (102 kg) |
| | | 240 | – | – | 130 | 175 | |
| | | 480 | – | – | 65 | 90 | |
| S-58** | 58.5 | 208 | – | – | 162.5 | 225 | 224 lbs. (102 kg) |
| | | 240 | – | – | 141 | 200 | |
| | | 480 | – | – | 71 | 90 | |

* Only 6, 7 & 9kW Models, 208 and 240 volts only, can be field converted to single phase (units are shipped 3-phase open delta). Larger branch circuit required than for balanced 3-phase of equal kW. (Balanced 3-phase available, consult factory.)
‡ 17.2kW Models available in 208v 3-phase only.
§ 18kW Models not available in 208v 3-phase.
* Not available in 208v single phase.
** Not available in 208v or 240v single phase.

## OPTIONS (NOT FOR RETROFIT)

- ❑ All Stainless Steel Body and Base

## ACCESSORIES

- ❑ Blended Phosphate Water Treatment System
- ❑ Shock Absorber – To Reduce Water Hammer
- ❑ Brass Pressure Reducing Valve with By-Pass
- ❑ Floor Mounting Hardware
- ❑ Adjustable Stainless Steel Legs 6" to 8" (15 to 20 cm)

## ARCHITECT SPECS

### Electric Booster Water Heaters

The Electric Booster Water Heater to supply the final 180°F (82°C) rinse for the dishwasher shall be a Hatco ....Model No. ....as manufactured for commercial use by the Hatco Corporation, Milwaukee, WI 53234 U.S.A.

The booster shall have the capacity to heat ....gph (lph) from ....°F to 180°F (....°C to 82°C) and it shall be rated at ....kW, ....volts, ....phase. The tank shall be designed for a working pressure of 150 psi (1034 kPa) and include a Hatco Castone® lining.

The heater shall be complete with all internal plumbing, including ¾" NPT pipe and fittings for inlet and outlet. All controls shall be built-in, including contactors and prewired in accordance with UL #1453 and NEC 422-27. Proper surface mounting circuit breaker or fused disconnect switch shall be provided by electrical contractor.

Electric heating elements shall be metal sheathed, controlled by close tolerance immersion thermostats. The booster shall be protected with high temperature limit switch (ECO) and low water cut-off.

The heater shall consist of stainless steel front and silver gray hammertone body with standard 6" (15 cm) legs (or stainless steel body, base and stainless steel adjustable legs).

The heater shall include a temperature/pressure relief valve, high-temperature pressure reducing valve with bypass, indicating temperature/pressure gauges and shock absorber.


HATCO CORPORATION P.O. Box 340500 Milwaukee, WI 53234-0500 U.S.A. • (800) 558-0607 • (414) 671-6350
Fax (800) 543-7521 • Int'l. Fax (414) 671-3976 • Web Site: www.

# somat®

## Remote Waste Pulping System

Item No. #105

SOMAT Model: HE-9TS
Hydra-Extractor

## Description

Standard SOMAT™ Model HE-9TS Hydra-Extractor™ with two, 5 HP drive motors, 5 HP or 7-1/2 HP return pump, chemical additive pump, automatic rinse system, valve package, Som-A-Trol™ control panel and discharge chute with limit switch.

### Benefits

- Up to 80% volume reduction
- Reduced labor cost
- Better sanitation
- Water conservation
- Improved operator morale
- Reduced silverware loss
- Processes a wide variety of waste

**Operation:** Slurry, consisting of 5% solids and 95% water, is automatically transported through a pipeline after being processed in the pulper(s) to the Hydra-Extractor, where water is removed and the resultant semi-dry pulp is discharged into a haul-away container. The extracted water is recovered and returned to the pulper(s) for re-use.The capacity of the Hydra-Extractor determines how many pulpers can be designed to operate with it concurrently.

Somat equipment provides an economic and efficient answer to cutting the high and ever increasing costs associated with waste handling. Manufactured by Somat Corporation of Coatesville, Pennsylvania, originators of waste pulping systems and specialists in waste reduction technology.

**Approval:**

## Technical Specifications

**Hydra-Extractor™:** Rigid stainless steel weldment with stainless steel legs, head assembly with two, 5 HP TEFC belt driven motors each matched to a 25:1 gear reducer, 28" long stainless steel discharge chute with limit switch, chemical additive pump, automatic rinse system. Water extractor mechanism consists of two, 9" diameter stainless steel screws each with a nylon brush edge, stainless steel adjustable gate and matching 9" diameter reinforced stainless steel screen.

**Valve Package:** All valves required for proper operation (automatic rinse system).

**Som-A-Trol™ (Electrical Control Panel):** UL approved. Includes all necessary electrical components prewired to a terminal strip in a NEMA 12 carbon steel enclosure.

### Options Available:

(see accessory sheet for description)

- ☐ Extended discharge chute
- ☐ Hinged chute
- ☐ Extended stand
- ☐ Pulp level detector
- ☐ NEMA 4 stainless steel Som-A-Trol
- ☐ Special electrical characteristics

### Special Requirements:

- 10 HP or larger return pump. Determined by piping conditions.
- Water economizing tank. Required when 10 HP or larger return pump is used.
- Pulp Screw Conveyor and controls. Required to convey pulp from discharge chute to haul-away container when location of container does not permit gravity discharge.

**Electrical Characteristics:** 208/230/460 Volt, 3 Phase, 60 Hertz

**Capacity:** 4,000 pounds per hour of foodservice waste mix, consisting of food scraps, plastics, milk cartons, paper, aluminum foil and cardboard

**Finish:** All exterior surfaces, except where polished stainless steel, are prime coated and finished with two coats of enamel paint.

Equipment only is supplied by SOMAT Corporation, installation, piping and wiring is not included.

somat
waste reduction technology

555 Fox Chase, Suite 107
Coatesville, PA 19320 USA
(610) 384-7000
Fax: (610) 380-8500
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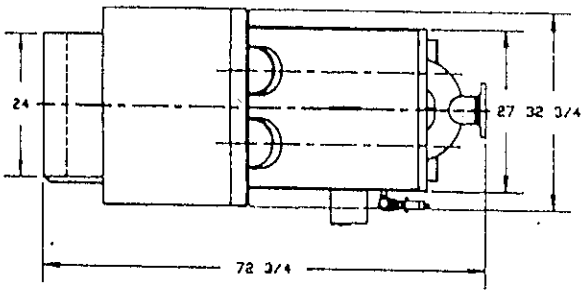
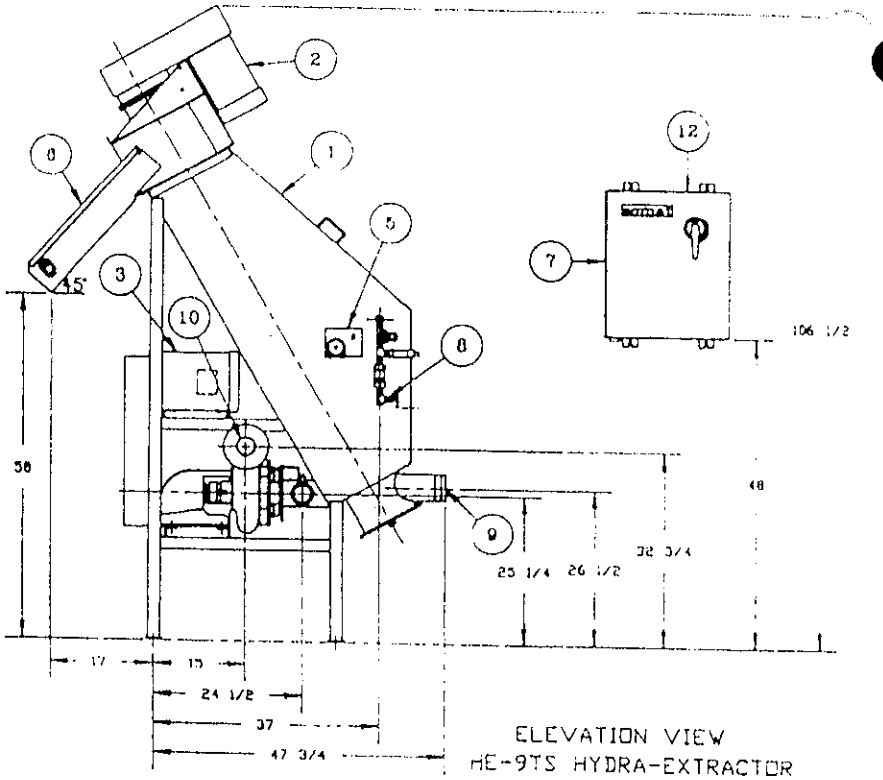
**somat®**

SOMAT Model: HE-9TS
Hydra-Extractor

# Remote Waste Pulping System




PLAN VIEW HE-9TS HYDRA-EXTRACTOR




ELEVATION VIEW
HE-9TS HYDRA-EXTRACTOR

Utility rough-ins may vary with final configuration.
Return piping assembly not shown.
Unit shown with 7 1/2 hp. return pump.

**Enlarge drawing by 129% to achieve 1/2" scale.**
**Reduce drawing by 64% to achieve 1/4" scale.**
***A complete CAD library is now available.***

## Somat Model HE-9TS Hydra-Extractor including:

1 Hydra-Extractor
2 (2) Hydra-Extractor drive motors, 5 hp ea.
3 Return pump, 7 1/2 hp
4 Autorinse spray system
5 Chemical Additive pump
6 Discharge chute, 28" lg. w/limit switch
7 Som-A-Trol panel (24"h x 20"w x 8"d)

## Utility Connections:

8 Fresh hot water inlet, 3/4" npt
9 Slurry inlet, 4" npt
10 Return pump outlet, 3" flanged
11 Autorinse drain, 1 1/2" npt (located on return piping assy.)
12 Customer power supply (4 wire service required)

## Dimensions:

**Height:** 107" (2720 mm)
**Length:** 71" (1805 mm)
**Width:** 36" (915 mm)

**Equipment Weight/Operating Weight:** 1660 lbs./1995 lbs.
**Crated Weight:** 1760 lbs.
**Crated Volume:** 128 cu. ft.

## Utility Requirements:

- Fresh hot water, 18 gpm @ 45 psig, 3/4" npt (approximate usage 180 gallons/cycle)
- Drain, 6" min. floor sink w/stainless steel removable basket.
- Power, 208V-60 amps; 230V-60 amps; 460V-30 amps, 3 phase, 60 Hz. (disconnect with circuit breaker provided in Som-A-Trol)

You'll find us in First Place.

TRADEMARK NOTICE: SOMAT, SOM-A-PRESS, HYDRA-EXTRACTOR, SOM-A-TROL, and SOM-A-STREAM are registered trademarks of Somat Corporation. SOM-A-SYSTEM, SOM-A-MIXER, TRACK-A-STREAM and SIDE WINDER are other trademarks of Somat Corporation.
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waste reduction technology

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ADVANCE TABCO

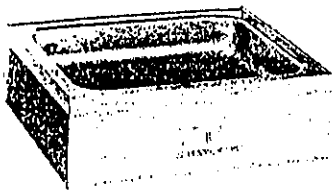
STAINLESS STEEL

# SERVICE & MOP SINKS

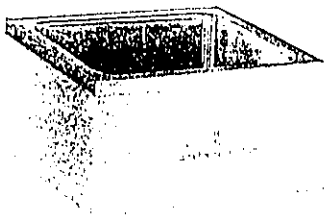
Item #: #109

Model #:

Project#:



9-OP-20

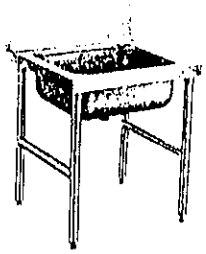


9-OP-40

FLOOR MOUNTED

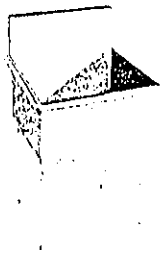
| Model # | Qty |
|---|---|
| ~~9-OP-20~~ | |
| 9-OP-28 | |
| ~~9-OP-40~~ | |
| 9-OP-48 | |

Conventional



8-OP-16

Economy



4-OP-18

| REQUIRED ACCESSORIES | Model # | Qty |
|---|---|---|
| Service Faucet | K-240 | |
| Mop Hanger | K-242 | |
| Hose & Bracket | K-244 | |
| ~~Utility Shelf~~ | ~~K-245~~ | |
| ~~Utility Shelf~~ | ~~K-246~~ | |

Conventional & Economy

| Model # | Qty |
|---|---|
| 8-OP-16 | |
| 4-OP-18 | |

| REQUIRED ACCESSORIES | Model # | Qty |
|---|---|---|
| FAUCETS | | |
| DRAINS | | |
| | | |
| | | |

## Floor Mounted 9-OP Series Specifications

(For conventional and economy see back)

### FEATURES:

Floor mounted unit eliminates the need of lifting heavy containers

No-Drip die formed recessed V-edge on three sides with a tile edge furnished on the rear.

Sink Bowl is seamless and is **Deep Drawn** designed.

**Deep Drawn** bowls having large liberal radii with a minimum of 3" and rectangular in design for increased capacity.

### CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

### MECHANICAL:

Supply is 1/2" IPS hot & cold.

Drain is cast brass with 2" IPS male threads.

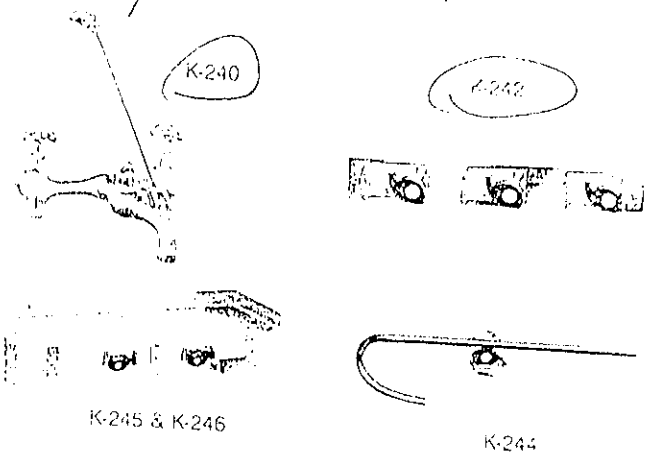
Stainless steel drain body is designed for easy installation to threaded coupling.

Faucet holes on 8" centers.

Faucets are not included (see accessories).

### MATERIAL:

Heavy gauge type "304" series stainless steel.




K-245 & K-246

K-244

ADVANCE TABCO

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Fax: (775) 972-1578

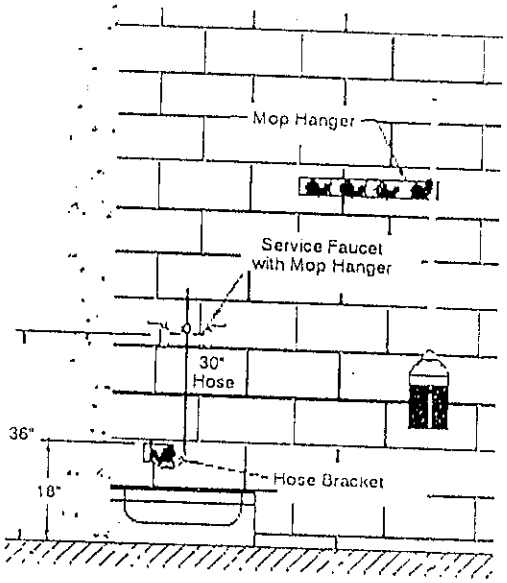
200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@[illegible]

# DETAILS and SPECIFICATIONS

ALL DIMENSIONS ARE TYPICAL

TOL ± .XX

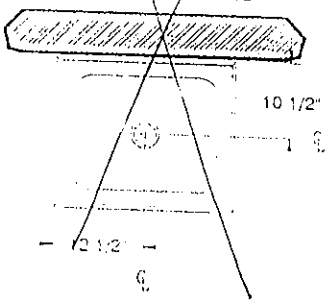
## SUGGESTED INSTALLATION




**9-OP-20:** 16" x 20" x 6" Bowl with 10" Overall Height.
**9-OP-28:** 20" x 28" x 6" Bowl with 10" Overall Height.
**9-OP-40:** 16" x 20" x12" Bowl with 16" Overall Height.
**9-OP-48:** 20" x 28" x 12" Bowl with 16" Overall Height.

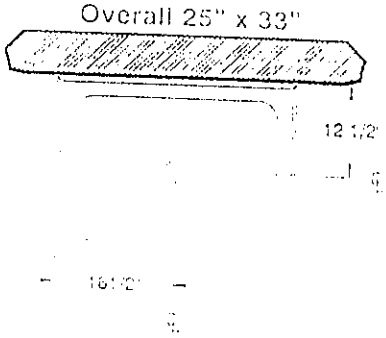
## 9-OP-20 / 9-OP-40

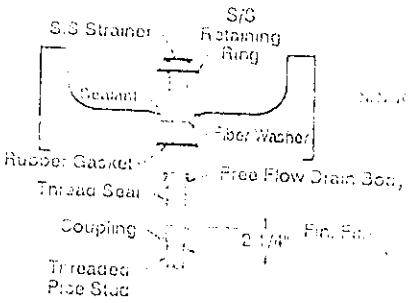
Overall 21" x 25"




## 9-OP-28 / 9-OP-48

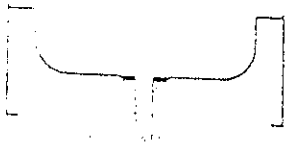
Overall 25" x 33"

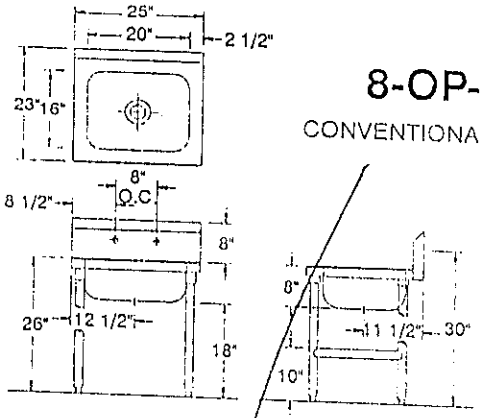



## Deep Drawn Bowls

1 1/2" Free Flow Drain & S.S Strainer
S/S Retaining Ring, Fiber Washer & Rubber Washer
(supplied by Advance)






## 8-OP-16

CONVENTIONAL DESIGN

**MECHANICAL:**

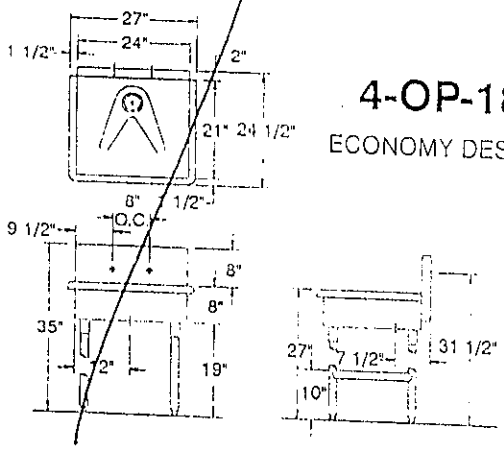
Supply is 1/2" hot & cold. Faucet holes on 8" centers
Waste drains are 1 1/2" IPS basket type and are included
Faucets are not included (see accessories).

**MATERIAL:**

Heavy gauge stainless steel.
Legs are stainless steel tubing with 1" adjustable metal bullet feet

**CONSTRUCTION:**

All TIG welded
Welded areas blended to match adjacent surfaces and to a satin finish.
Deep Drawn sink bowl and apron unit is seamless
No-Drip die formed V-edge




## 4-OP-18

ECONOMY DESIGN

**MECHANICAL:**

Supply is 1/2" hot & cold. Faucet holes on 8" centers
Waste drains are 1 1/2" IPS basket type and are included
Faucets are not included (see accessories).

**MATERIAL:**

Heavy gauge stainless steel.
Legs are stainless steel tubing with 1" adjustable metal bullet feet

**CONSTRUCTION:**

All TIG welded.
Welded areas blended to match adjacent surfaces and to a satin finish.

ADVANCE TABCO

ADVANCE TABCO is constantly engaged in a program of

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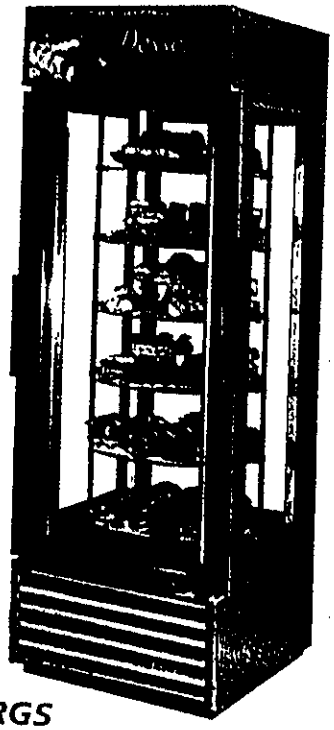
Project Name: #120
Location:
Item No: Qty:
Model No:

## G4SM Series - Glass Door Merchandisers



G4SM-23-RGS

*TRUE is the world's largest manufacturer of glass door merchandisers.*

# Glass Door Reach-In Refrigerators

☐ G4SM-23, ☐ G4SM-23-PT,
☐ G4SM-23RL ☐ G4SM-23RL-SI,
☐ G4SM-23-RGS

## SPECIFICATIONS / FEATURES

***CABINET CONSTRUCTION:***
- .040 copper aluminum exterior.
- White anodized aluminum interior top cabinet liner with 300 series stainless steel floor. Construction of liner in accordance with NSF standards.
- Cabinet mounted on a welded, galvanized frame rail, painted for additional corrosion protection.
- Safety shielded fluorescent interior lighting.

***DOORS:***
- Triple pane thermal insulated glass. Doors extend full width of cabinet shell. Door gaskets of one piece construction.
- Adjustable torsion spring mechanism. The face of each door fitted with a 12" long handle.

***INSULATION:***
- Entire cabinet structure insulated, using foamed-in-place CFC free polyurethane foam.

***SHELVING:***
***wire shelf models***
- 4 adjustable vinyl coated wire shelves. Shelves capable of supporting up to 250 lbs.
- Full height shelf support pilasters, with double oblong holes on 1/2" centers. Pilasters made of the same material as cabinet interior. Four (4) chrome plated, stainless steel shelf clips to be included for each shelf.

***glass shelf model***
- 6 removable 19 5/8" glass shelves. Bottom mirrored shelf for reflective display. Shelves capable of supporting up to 30 lbs.
- shelves slowly revolve.

***REFRIGERATION SYSTEM:***
- Refrigeration system factory balanced using CFC free 134A refrigerant.
- Bottom mounted condensing unit - easy access for maintenance.
- Factory pre-engineered capillary tube system with oversized condenser and evaporator to reduce product pull down time and to consistently maintain 32°-38°F interior cabinet temperature. (non-adjustable capillary tube system superior to problematic expansion valve)
- Evaporator - epoxy coated at the time of manufacture to eliminate the potential of corrosion.

***ELECTRICAL CHARACTERISTICS:***
- Unit completely pre-wired at factory, and ready for final connection to a 115/60/1 phase - 15 amp dedicated outlet. A cord and plug set to be included.
- A sole use circuit is required.

115/60/1

*Also available:*
- *Slide Door Models*
- *Freezer Models*
- *Wine Merchandiser*
- *Rear Load Models*
- *Ice Merchandisers*
- *Glass End Merchandisers*
- *Convenience Store Coolers*
- *Counter-Top Merchandisers*
- *Floral Merchandisers*

Printed in U.S.A.

5/15/01

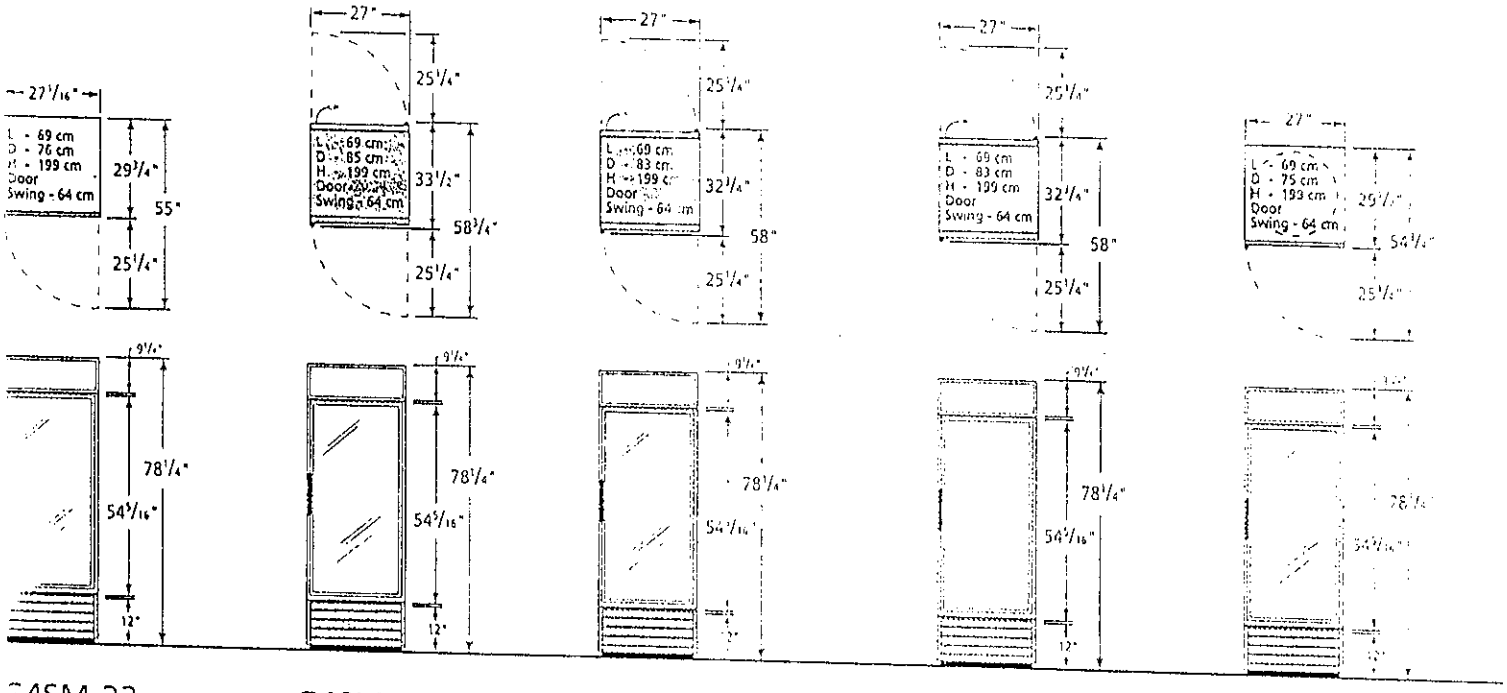
5 YEAR NSF CSA UL

*Exceptions:*

*APPROVALS:*

Specifications subject to change without notice.

# G4SM Series: Glass Door Merchandisers - swing door




G4SM-23 | G4SM-23-PT | G4SM-23RL | G4SM-23RL-SI | G4SM-23-RGS

## Rough-In Data

| odel | Doors | Capacity (Cu. Ft) | # of Shelves | Dimensions (inches) L | D | H | HP | Volts | PH | Amps | NEMA Config. | Cord Length (feet) | Crated Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SM-23 | 1 | 23 | 4 | 27 1/16 | 29 3/4 | 78 1/4 | 1/2 | 115 | 1 | 10.0 | 5-15 | 9 | 403 |
| SM-23RL | 1fr / 1 bk | 23 | 4 | 27 | 32 3/4 | 78 1/4 | 1/2 | 115 | 1 | 10.0 | 5-15 | 9 | 416 |
| SM-23RL-SI | 1fr / 1 bk | 23 | 4 | 27 | 32 3/4 | 78 1/4 | 1/2 | 115 | 1 | 10.0 | 5-15 | 9 | 416 |
| SM-23-PT | 1fr / 1 bk | 23 | 4 | 27 | 33 1/2 | 78 1/4 | 1/2 | 115 | 1 | 10.0 | 5-15 | 9 | 425 |
| SM-23-RGS | 1 | 23 | 6 | 27 | 29 1/2 | 78 1/4 | 1/2 | 115 | 1 | 10.0 | 5-15 | 9 | 450 |

Specifications subject to change without notice.

## ndard Features

igh luster copper aluminum exterior.
/hite anodized aluminum interior top nd stainless steel bottom.
versized and balanced, environmentally iendly refrigeration system - holds 32°F-3°F.
ottom mount compressor.
ide out compressor can be serviced asily and accessed by a single repairman.
ositive seal torsion spring, self-closing oors.

- Adjustable vinyl coated wire shelves (RGS model standard with six glass shelves).
- Epoxy coated evaporator.
- Fluorescent interior lighting.
- Environmentally friendly 134A refrigerant (CFC free).
- 1 year parts & labor warranty (USA).
- 5 year compressor warranty.

## Optional Accessories

- Additional shelves available.
- Barrel locks available.
- Castors and legs available for most models.

| Clearance Required For Coolers (USA) | | |
|---|---|---|
| Sides Inches/mm | Top Inches/mm | Rear Inches/mm |
| N/A | 6 / 152 | N/A |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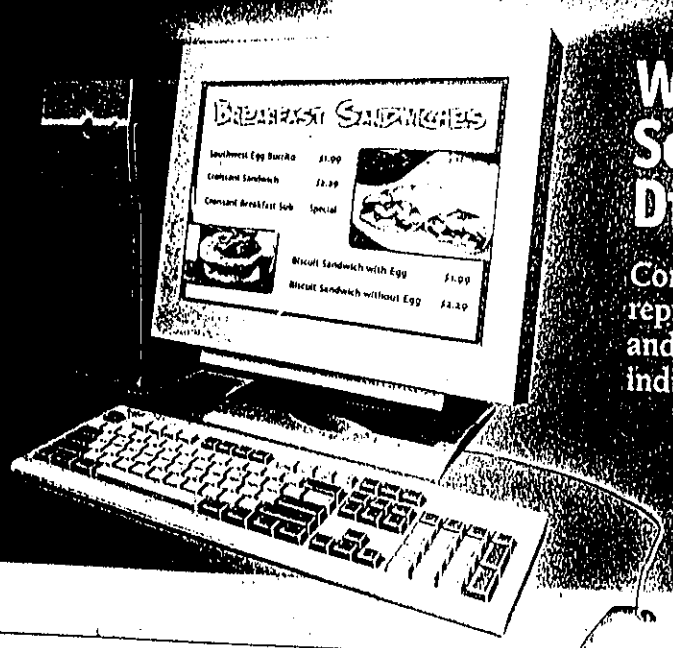
Quality and results you can see! Innovative and attractive, durable and affordable, MenuMark's diverse selections can transform your retail space and increase your sales. From free-standing sidewalk boards to 3-dimensional displays and much more, MenuMark provides high quality without the high price. Let us show you – call us today!




# We Have Electronic Software Solutions for Digital Menu Boards!

Contact your local MenuMark representative to find out how this new and exciting technology can meet your individual retail needs.

ADVANCE TABCO

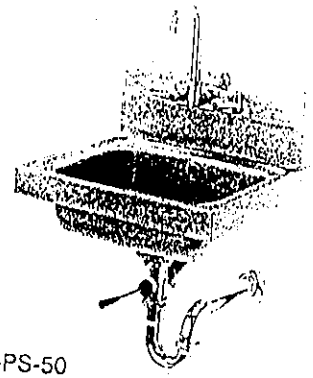
# HAND SINKS
## TRADITIONAL

Item #: #C1

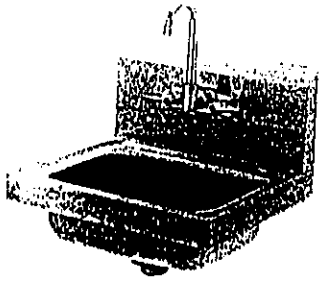
Model #:

Project #:

Keyhole Bracket for easier installation and more stability.



7-PS-50



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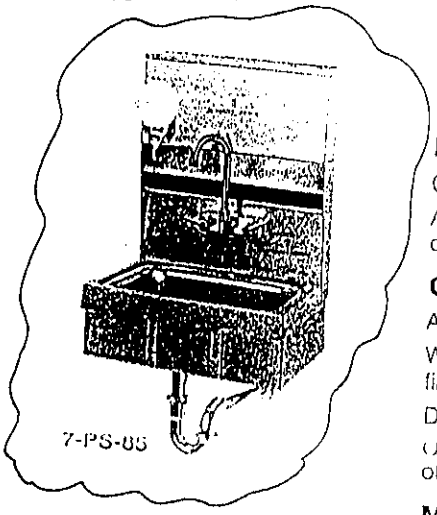

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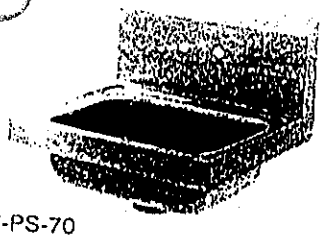
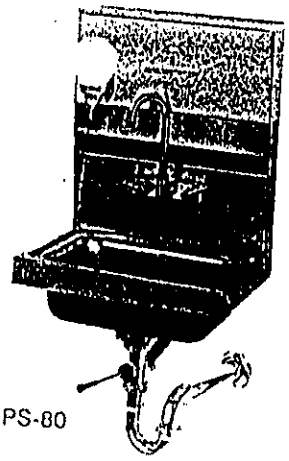
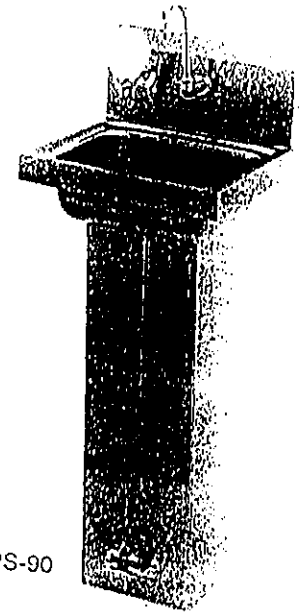


7-PS-70



7-PS-80



7-PS-90

| Model # | Qty |
|---|---|
| 7-PS-50 | |
| 7-PS-60 | |
| 7-PS-70 | |
| 7-PS-80 | |
| 7-PS-85 | |
| 7-PS-90 | |

### FEATURES:

One piece **Deep Drawn** sink bowl design.

All sink bowls have a large liberal radii with a minimum dimension of 2" and are rectangular in design for increased capacity

### CONSTRUCTION:

All TIG welded.

Welded areas blended to match adjacent surfaces and to a satin finish.

Die formed Countertop Edge with a 3/8" No-Drip offset

One sheet of stainless steel is used. There are no welded seams other than corners.

### MECHANICAL:

Faucet supply is 1/2" IPS male thread hot and cold.

K-59 splash mounted 4" O.C. gooseneck faucet chrome plated furnished with aerator.

K-6 stainless steel basket drain 1-1/2" IPS.

K-26 lever operated drain and built-in overflow with plastic overflow tube and spring clamps.

7-PS-14 P-Trap is 1 1/2" chrome plated.

7-PS-12 Soap Dispenser.

Towel dispenser with hinged cover. Unit uses standard C-fold towels.

Sink bowl is 10" x 14" x 5".

### MATERIAL:

Heavy gauge type 304 series stainless steel.

Wall mounting bracket is stainless steel and of offset design.

All fittings are brass / nickel plated unless otherwise indicated.

ADVANCE TABCO

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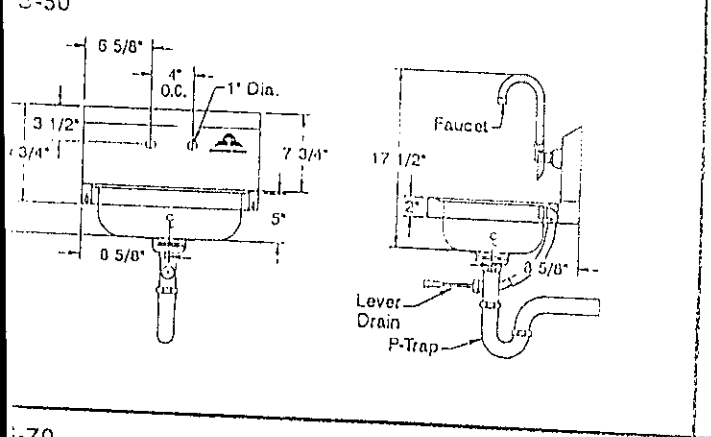
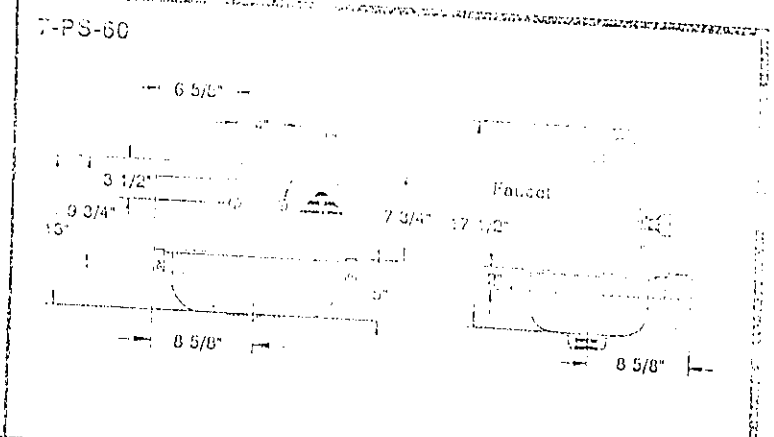
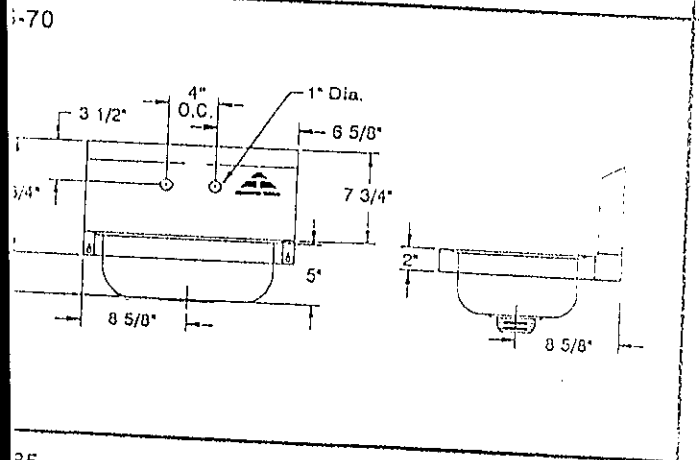
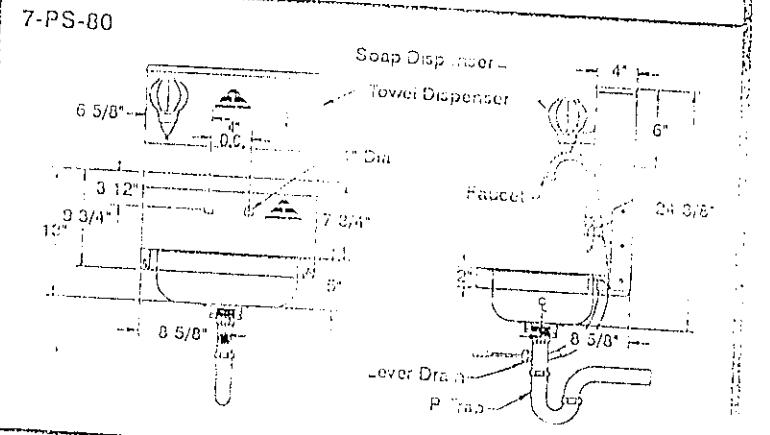
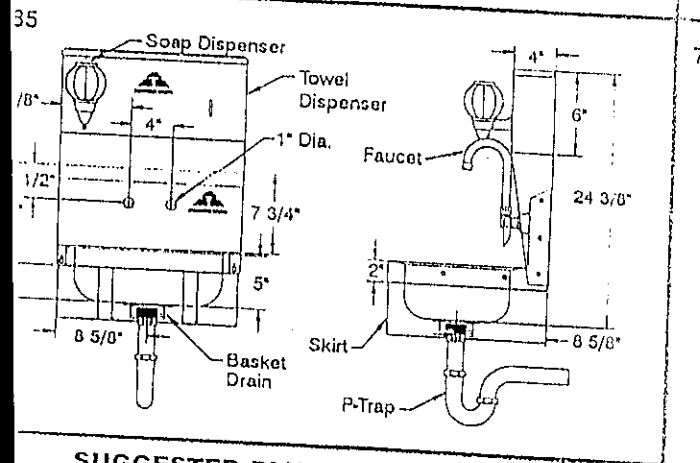
200 Heartland Boulevard, Edgewood, NY 11717-8380
e-mail: advancetabco@advancetabco.com www.advancetabco

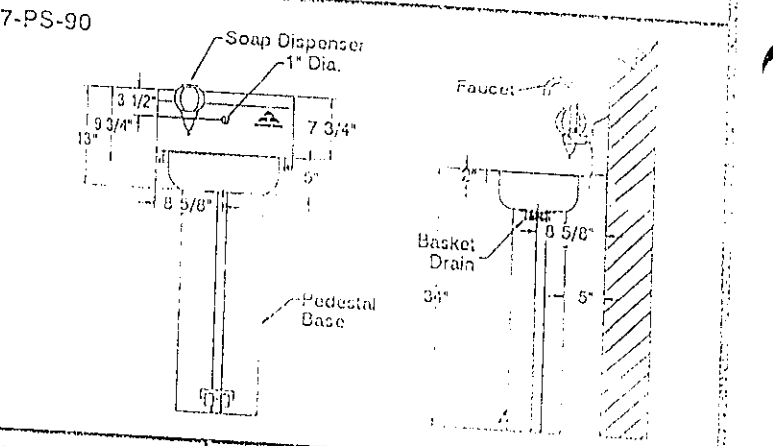


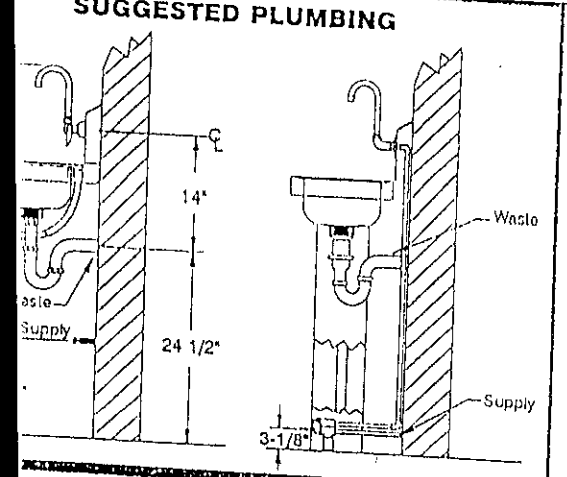



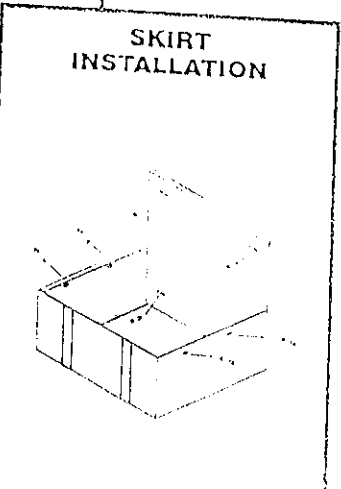



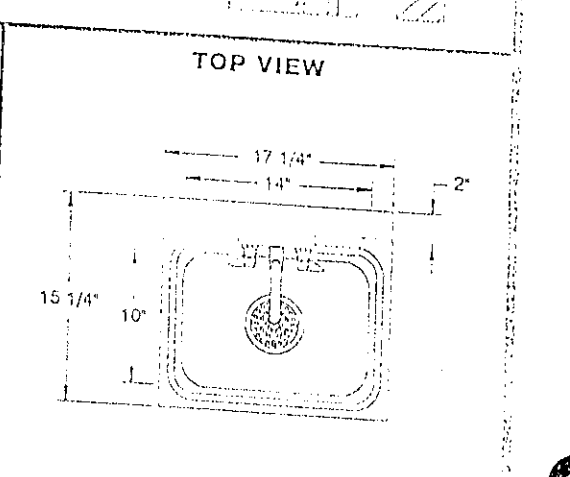




TOL ± .500"
ALL DIMENSIONS ARE TYPICAL

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ADVANCE TABCO is constantly engaged in a program of improving our products. Therefore, we reserve the right to change specifications without prior notice.
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Delfield

Project _____

Item Number #C4

Quantity _____ Date _____

Approval _____

# SHR-S/SHR-G

## Supremacy Series® Solid/Glass Heated Reach-In

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units are mounted on 6" (15.24 cm) legs.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Hinged glass front door(s). Glass doors are constructed with a combination of extruded aluminum & PVC, and are provided with magnetic gaskets. Doors will have self-closing hinges and continuous handle along vertical dimension of door(s). Glass door constructed to eliminate need for heater wires.

- Please specify right or left hand hinging at time of order.

**DUAL VOLTAGE MODELS ONLY**

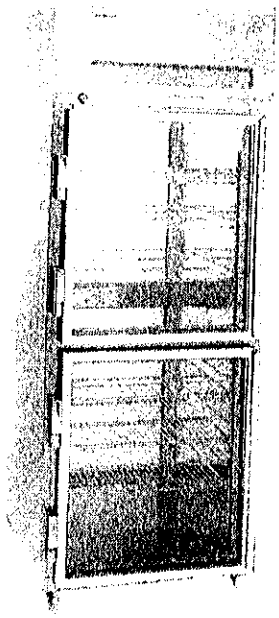
Electrical connections shall be 115/208-240 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

**HEATING ASSEMBLY**

Cabinets to be designed to maintain temperature up to 200°F. Helical shaped, tubular fin heating element. High speed blower to provide uniform airflow in cabinet. Removable/replaceable heating system. No exposed elements inside cabinet. Fan and heating elements service accessible without tools. Temperature to be controlled by an adjustable electronic thermostat equipped with an analog display. On/off switch in front.

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Plastic laminate on doors & ends
- Additional shelves and bridges
- Tray slides
- Kick panels
- Half-size hinged glass or steel stainless doors, two doors per section
- Correctional Facilities package
- 4" Casters



**MODEL SHR1-GH**
(Shown with optional left hand hinging)

c UL NSF UL 404A

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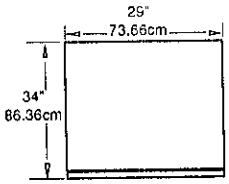
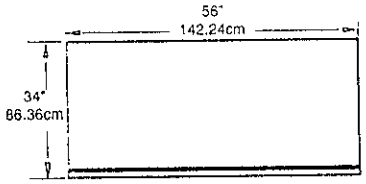
Delfield

# SHR-S/SHR-G

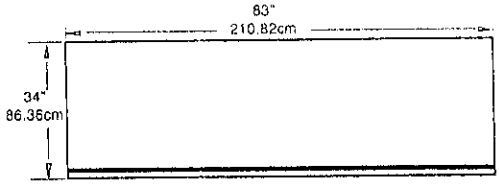
## Supremacy Series® Solid/Glass Heated Reach-In



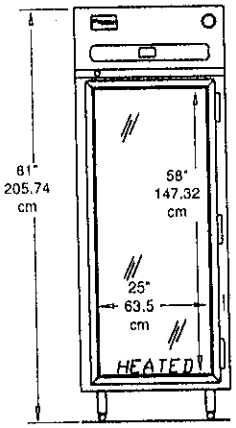

PLAN VIEW



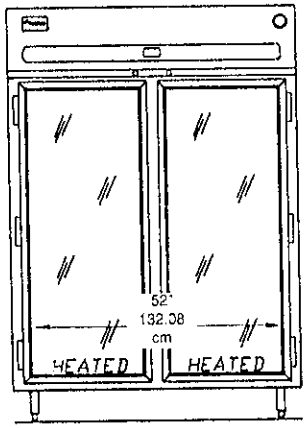

PLAN VIEW



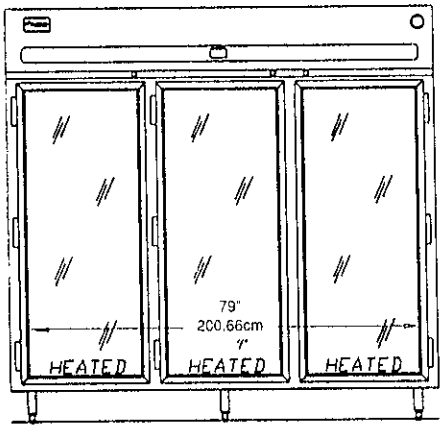

PLAN VIEW



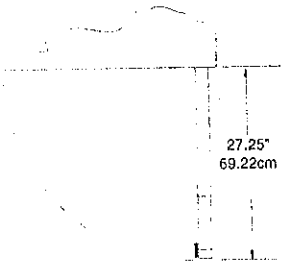

FRONT ELEVATION



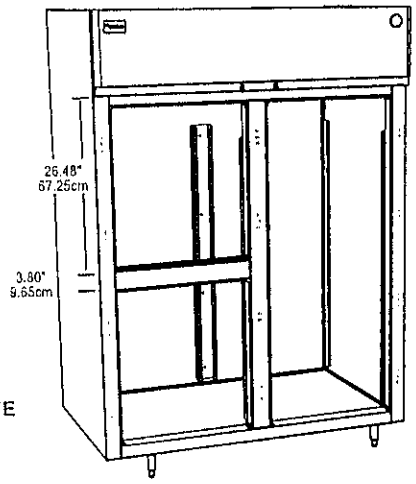

FRONT ELEVATION



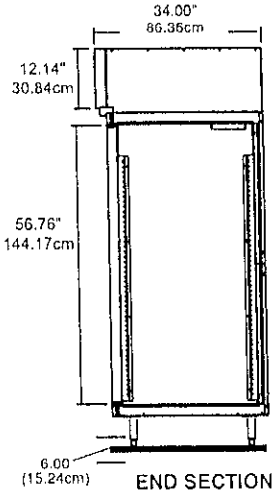

FRONT ELEVATION




DOOR CLEARANCE DETAIL




PERSPECTIVE VIEW




END SECTION VIEW

## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTU/HR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| STAINLESS DOORS | | | | | | | | | | |
| SHR1-S | 115/208-240 | 9.0 | 24.96 | 12.81 | 3 | NA | NA | NA | 428 | NA |
| SHR2-S | 115/208-240 | 16.0 | 51.92 | 27.54 | 6 | NA | NA | NA | 596 | NA |
| SHR3-S | 115/208-240 | 17.8 | 78.89 | 42.27 | 9 | NA | NA | NA | 782 | NA |
| GLASS DOORS | | | | | | | | | | |
| SHR1-G | 115/208-240 | 9.0 | 24.96 | 12.81 | 3 | NA | NA | NA | 438 | NA |
| SHR2-G | 115/208-240 | 16.0 | 51.92 | 27.54 | 6 | NA | NA | NA | 569 | NA |
| SHR3-G | 115/208-240 | 17.8 | 78.89 | 42.27 | 9 | NA | NA | NA | 812 | NA |

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DSSRH 02/03

Project:

Prepared for: Item# C10

Date:

# VENTILATOR SYSTEMS

## *ENERGY AIRE* AUTO WASH WALL MOUNTED

**Models**
**AWWO**
**AWWP**
**AWWI**
**AWWE**
**AWWD**

AVTEC

### APPLICATION DATA

For use over all types of cooking equipment; unique grease extractor has auto wash and internal fire protection and extracts up to 95% of grease contaminants. Canopies are generally installed 6'-6" above finished floor. Stainless steel enclosure panels to the ceiling are available, or the hood may be recessed into the non-combustible false ceiling, depending on type of air make up - contact factory.

### SUPPLY AIR MAKE-UP

☐TYPE " P" LOW VELOCITY FRONT DISCHARGE SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. Normally air is heated to 55°-65°F. Consult factory for specifics.

The perforated front panel slows the supply air velocity to lessen the effect of partially tempered outside air on conditioned room air. When lowest velocity is desired, the 30" high plenum [ventilator] is recommended.

☐ TYPE "I" INTEGRAL "SHORT CYCLE" SUPPLY

The integral "short cycle" supply air plenum may be used with up to 70% untempered air per U.L. testing. Some local codes limit this percentage or do not allow the "short cycle" concept. Normally, this type hood is used in warmer climates not susceptible to the colder, higher density winter air.

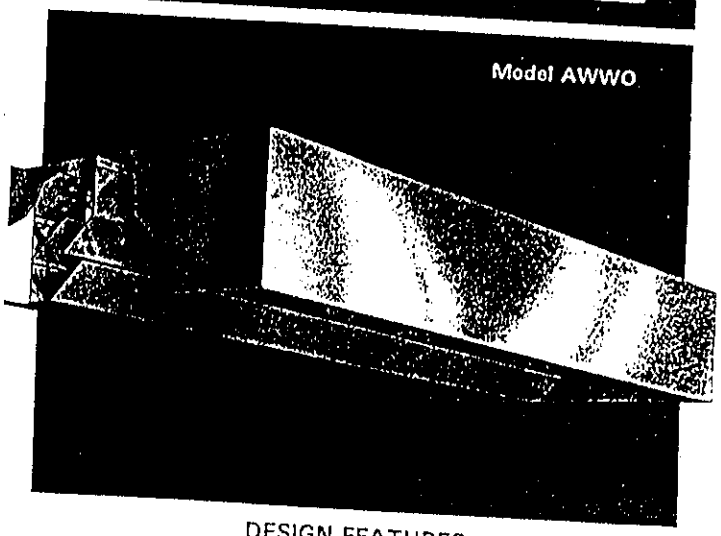
Integral untempered supply make-up air varies according to exhaust requirements, 20% recommended from adjacent areas to contain odors within the kitchen and remaining amount from ceiling registers located ideally 20 ft. from the hood. Consult factory for specifics.

☐TYPE "E" EXTERNAL FRONT GRILL SUPPLY

Same air volumes as "P" type. Recommended for installations where finished ceiling is less than 9 ft. prohibiting effective use of "P" type [above]. The 4-way diffusers and internal balancing dampers allow precise directional control. Generally, air is conditioned to room temperature and directed just below the ceiling.

☐TYPE "D" DUAL EXTERNAL AND INTERNAL SUPPLY

Integral supply make-up air normally sized at 80% of exhaust volume, remaining 20% from adjacent areas to contain odors within the kitchen. A combination of "I" and "E" type, allows for fine tuning of short cycle air supply. Varying climates may require incoming air to be conditioned to room temperature.




### DESIGN FEATURES

- U.L. Listed. Complies with all national codes.
- Auto wash and internal fire protection system.
- Unique extractors remove up to 95% of grease contaminants.
- Integral supply air balancing and fire damper.
- Electromechanical, resettable exhaust fire damper.

### OPTIONS AND ACCESSORIES

- U.L. Listed fusible link exhaust fire damper.
- Stainless Steel enclosure panels to ceiling.
- Auto Wash Control Panel with:
  - √ Fan and/or light switch
  - √ Fire System Interface
  - √ H.O.A. Fan Starter Interface
- Integral fire suppression system enclosure.
- Wet chemical fire suppression system.
- Water mist fire protection system with gas reset.
- Fan motor controller package
- Exhaust & supply fan package

### EXHAUST AIR RECOMMENDATIONS

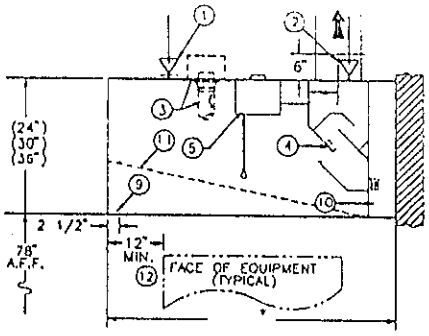
| TYPE EQUIPMENT | MIN. EXHAUST |
|---|---|
| **Light Duty**<br>Ovens, Steamers, Kettles [25 psig] | 200 cfm/lin. ft. |
| **Medium Duty**<br>Ranges, Griddles, Fryers, Fry Pans, Kettles [45 psig] | 250 cfm/lin. ft. |
| **Heavy Duty**<br>Hot Top Ranges, Upright Broilers, Electric Charbroilers | 300 cfm/lin. ft. |
| **Extra Heavy Duty**<br>Gas and Solid Fuel Charbroilers, Woks [water cooled], Kettles [100 psig] | Consult Factory |

The above figures are to be used as a guideline only. Since local field conditions vary greatly, we strongly suggest you consult the factory or your local AVTEC Representative.

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 [630] 851-4800

VENT. MODEL # AWW_ PROJECT:_____ ITEM# _____

## SECTION VIEWS

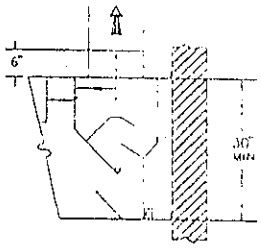



☐ AWWO

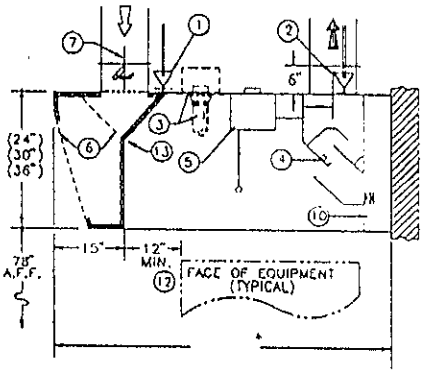
*Recommended width: 51", 57", or 63"

LEGEND

1. Hanger brackets
2. U.L. Listed damper
3. U.L. Listed light fixture (globe) (incandescent)(fluorescent)
4. Auto Wash Extractor
5. Damper reset housing
6. Supply air diffuser
7. Balancing damper
8. Fire damper
9. S/S gutter
10. 6" air space
11. 18" Front with tapered End Cap.
12. Recommended minimum overhang. Salamanders and Upright Broilers require 18"
13. Insulation-standard on type I and II

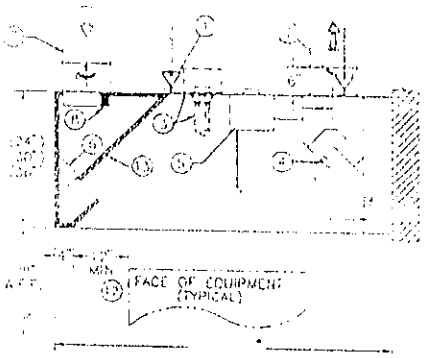



HIGH VOLUME EXTRACTOR ALLOWS LOWER STATIC PRESSURE AT 500 CFM/LF AND HIGHER



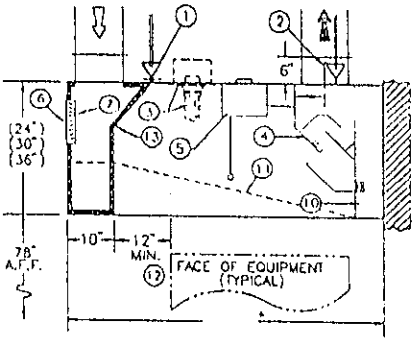

☐ AWWP

*Recommended width: 66", 72", or 78"



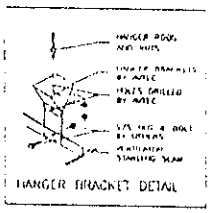

☐ AWWI

*Recommended width: [illegible]

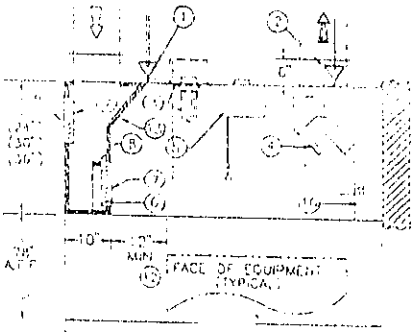



☐ AWWE

*Recommended width: 61", 67", or 73"



HANGER BRACKET DETAIL




☐ AWWO

*Recommended width: [illegible]

## AIR FLOW CHART

| VENT LENGTH | 200 CFM/LINEAR FT (Light Duty) | | | | 250 CFM/LINEAR FT (Medium Duty) | | | | 300 CFM/LINEAR FT (Heavy Duty) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | EXH. CFM 1.2"SP | EXH. DUCT COL. | SUP. CFM .26"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.3"SP | EXH. DUCT COL. | SUP. CFM .26"SP | SUPPLY DUCT COLLAR | EXH. CFM 1.68"SP | EXH. DUCT COL. | SUP. CFM 26"SP | SUPPLY DUCT COLLAR |
| 3' | 600 | 10"x6" | 480 | 10"x10" | 750 | 10"x6" | 600 | 10"x10" | 900 | 10"x8" | 720 | 10"x10" |
| 4' | 800 | 10"x7" | 640 | 10"x10" | 1000 | 10"x8" | 800 | 10"x16" | 1200 | 10"x10" | 960 | 10"x16" |
| 5' | 1000 | 10"x8" | 800 | 10"x16" | 1250 | 10"x10" | 1000 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" |
| 6' | 1200 | 10"x10" | 960 | 10"x16" | 1500 | 10"x12" | 1200 | 10"x16" | 1800 | 10"x15" | 1440 | 10"x20" |
| 7' | 1400 | 10"x12" | 1120 | 10"x16" | 1750 | 10"x14" | 1400 | 10"x20" | 2100 | 10"x17" | 1680 | 10"x30" |
| 8' | 1600 | 10"x13" | 1280 | 10"x20" | 2000 | 10"x16" | 1600 | 10"x30" | 2400 | 10"x20" | 1920 | 10"x30" |
| 9' | 1800 | 10"x15" | 1440 | 10"x20" | 2250 | 10"x18" | 1800 | 10"x30" | 2700 | 10"x22" | 2160 | 10"x30" |
| 10' | 2000 | 10"x16" | 1600 | 10"x30" | 2500 | 10"x20" | 2000 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" |
| 11' | 2200 | 10"x18" | 1760 | 10"x30" | 2750 | 10"x22" | 2200 | 10"x30" | 3300 | 10"x27" | 2640 | 10"x40" |
| 12' | 2400 | 10"x20" | 1920 | 10"x30" | 3000 | 10"x24" | 2400 | 10"x40" | 3600 | 10"x28" | 2880 | 10"x40" |
| 13' | 2600 | 10"x21" | 2080 | 2-10"x16" | 3250 | 10"x26" | 2600 | 2-10"x20" | 3900 | 10"x32" | 3120 | 2-10"x30" |
| 14' | 2800 | 10"x23" | 2240 | 2-10"x16" | 3500 | 10"x28" | 2800 | 2-10"x20" | 4200 | 10"x34" | 3360 | 2-10"x30" |
| 15' | 3000 | 10"x24" | 2400 | 2-10"x16" | 3750 | 10"x30" | 3000 | 2-10"x20" | 4500 | 10"x36" | 3600 | 2-10"x30" |

For cfm, static pressure and duct collar sizes other than above, see Air Flow Requirements form no. 14012. Air speeds vary according to duct collar size; average speeds are 1800 fpm exhaust and 1000 fpm supply.

Use above chart for supply air types "P", "E" & "D"; [illegible]% supply air volume shown, 20% from adjacent areas to contain cooking odors within kitchen.

Do not use above chart for untempered short cycle supply type "I"; this should be sized at 40% to 70% of exhaust cfm, 20% from adjacent areas to contain odors, remaining amount from ceiling registers approximately 20 ft. from hood - contact factory.


**AVTEC INDUSTRIES INC. 120 BRENDALL POINT DR. OSWEGO, IL 60543 FAX[630] 851-5777**



AVTEC'S policy of [illegible] product improvement includes [illegible] change [illegible] notice



Form no. 14013 rev. 3/03 ©1993 Av[illegible] Industries Inc.

Project:

Prepared for: Item# C10

Date:

# AUTO WASH VENTILATOR CONTROL PANEL

Model VCWW

AVTEC

U.S. Patent # 4,156,432

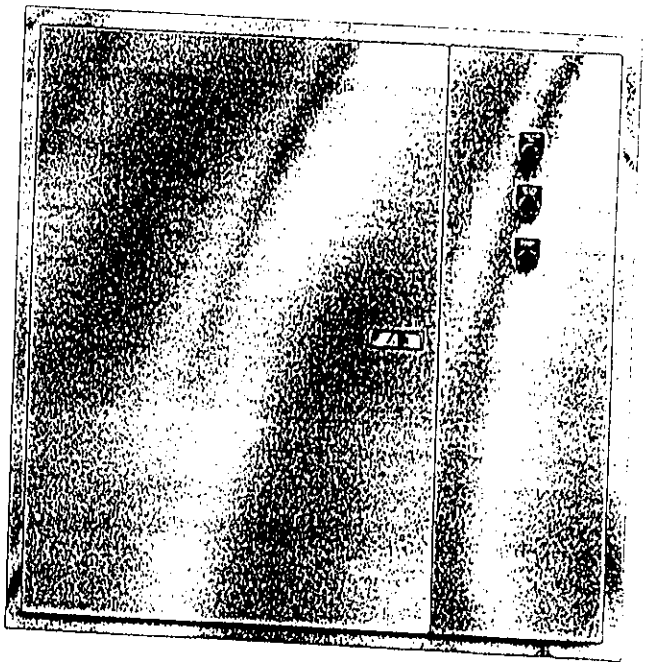
*ECONOMY CONTROL . . WITH AVTEC*

## APPLICATION DATA

The AVTEC Auto Wash Ventilator Control Panel is supplied with the AVTEC Auto Wash Ventilator. The cabinet houses the electrical and plumbing components necessary to control the exhaust [and air make-up] fan(s), auto wash self-cleaning cycle and plenum fire protection system.

One panel will control one or more fans if operated simultaneously. Each panel will operate up to 50 linear feet of ventilator with a single wash [0-10] minutes]; for over 50 feet, use two or more panels. If hot water and low pressure is limited and sequential washes are desired, we recommend the AVTEC "PAWS" Control Panel.

An electric thermal detector fire switch is mounted in the duct collar and automatically activates the plenum fire protection [spray], closes the adjacent fire damper and turns off the fan. An optional flush mounted or remote manual pull fire switch is available to activate the plenum fire protection [spray] and exhaust fan [to remove fumes]. Surface cooking fire protection should be specified with this system. AVTEC'S MIST-A-FIRE System is recommended if a building sprinkler system is available; the control panel for this system may be combined with the AVTEC "PAWS" Control Panel.



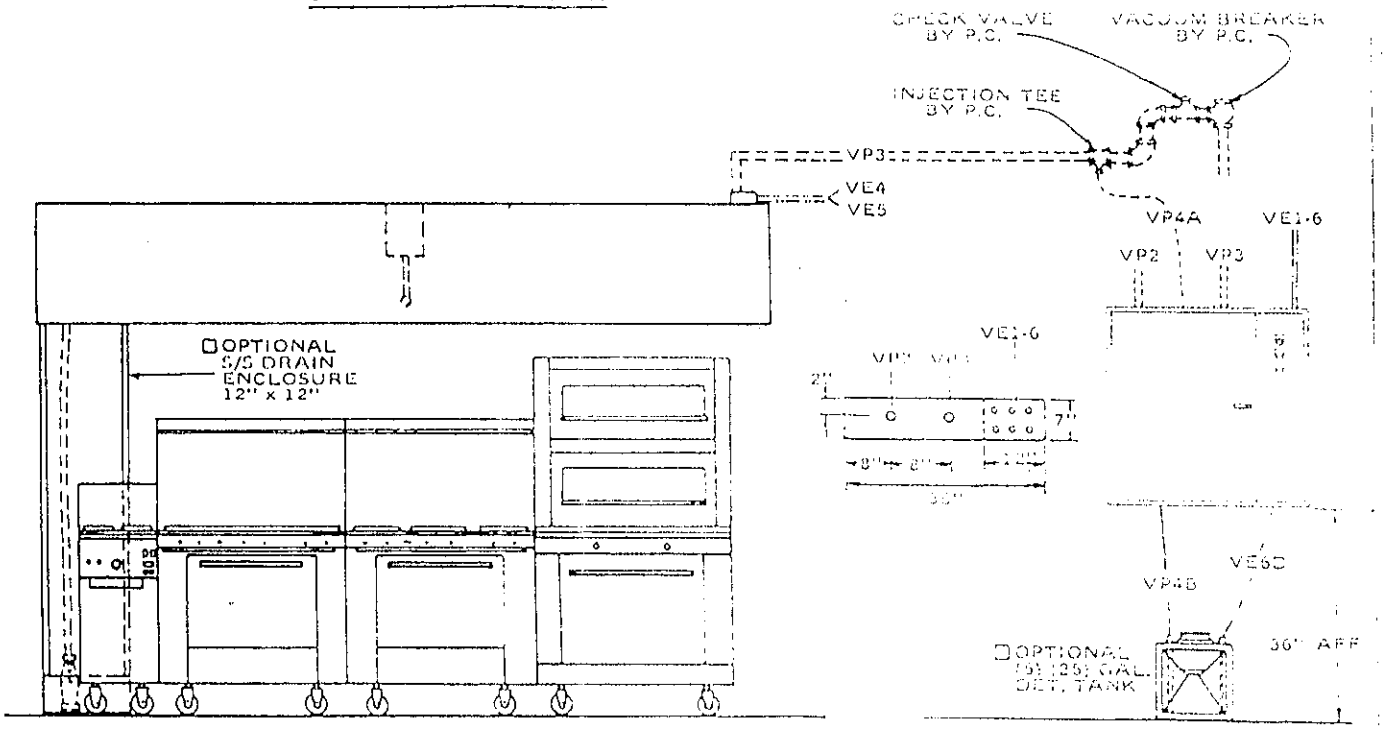
## DESIGN FEATURES

UL NSF

- Automatic Wash System shuts OFF fan and injects detergent and hot water into grease extractor chamber for up to ten minutes
- Optional Manual Fire Switch initiates fire quenching spray in plenum and activates fan to remove toxic fumes.
- Automatic Thermal Fire Detector initiates fire quenching spray in plenum, closes the damper to prevent fire from spreading to the ductwork and deactivates the fan.
- Optional Vent Light Switch may be conveniently mounted on control panel.
- Optional Low Level Detergent Alarm

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 [630] 851-4800

## SERVICE CONNECTIONS




### ELECTRICAL CONTRACT

**BUILDING SERVICES**

VE1 ☐ 20A 120/1 control power supply
VE2 ☐ 20A 120/1 power supply for vent-lights.

**FIELD INTERCONNECTIONS**

VE3 ☐ 120/1 control circuit to fan magnetic motor controller, for exhaust (& supply) fan(s)
VE4 ☐ 20A 120/1 power from AVTEC panel to vent lights.
VE5 ☐ 120/1 to thermo detector damper box.
VE6 ☐ Provide (2W) field interconnects to (remote only)
- A ☐ Manual Pull Fire Switch
- B ☐ Wash Solenoid Valve 120 volt
- C ☐ Detergent Pump 120 volt
- D ☐ Detergent Sensor Probe 20vdc

**CONTROL CABINET SIZE**

Standard: 36" x 36" x 7" d
5 Gal. Det. Tank: 36" x 36" x 10" d
Cold Water Mist: 42" x 42" x 7" d
1¼" mounting flange for recessed option.
Add ½" all sides for wall opening.
Weight: 220 lbs. crated

**PLUMBING DATA - LENGTH/SIDE**

| LENGTH | H. W. INLET |
|---|---|
| 0 - 15' | ½" |
| 16' - 24' | ¾" |
| 25' - 50' | 1½" |
| over 50' | ** |

** Use multi-wash. Contact factory

H.W. Flow Rate=1.2 GPM/ft.
@25 psi (140°F for 3-5 min.)

### PLUMBING CONTRACT

**BUILDING SERVICES**

VP2 ☐ ____" hot water (140°F) to control panel (20 to 40 psi)

**FIELD INTERCONNECTIONS**

VP3 ☐ ____" hot water (140°F) to ventilator ____ places.
VP4 ☐ 3/8" Detergent tubing
- A ☐ From detergent pump to injection tee.
- B ☐ Injected in remote detergent tank.

**OPTIONAL**

VP7 ☐ 3/4" cold water to control panel.
VP8 ☐ 3/4" cold water to vent ____ places.

NOTE: Other required connections are shown on Ventilator Roughing Data Sheet.

IMPORTANT NOTE: The various trades' installation responsibilities must be included in their contracts.

## SPECIFICATIONS

Provide AVTEC U.L. Listed, NSF approved, (surface) (recessed) wall mounted Auto Wash Ventilator Control Panel, Model No. VCWW to operate AVTEC ventilator fan(s), wash cycle and internal plenum and duct collar fire protection system. Control panel to be 18 gage stainless steel and shall house all electrical and plumbing components.

Electrical components to consist of FAN START, FAN STOP/WASH START & RESET buttons, adjustable auto wash timer, 0 to 10 minutes, detergent pump prime switch, and thermal detector switch. RESET button to interrupt FAN ON or WASH ON modes.

Plumbing components to consist of ball type shut off valve, wye-strainer, pressure-temperature gage, shock absorber, solenoid valve, detergent pump and 2 gallon reservoir.

All components to be pre-wired and pre-plumbed ready for field connection by applicable trades.

### ACCESSORIES

- ☐ Provide illuminated STOP/START buttons.
- ☐ Provide (panel mounted) & (remote) manual pull fire switch.
- ☐ Provide vent light switch.
- ☐ Provide (integral 5 gal.) (remote 5 gal.) (remote 25 gal.) detergent tank (and pump).
- ☐ Low Level Detergent Indicator with Audio Alarm

### OPTIONAL

- ☐ Provide micro-switch in lieu of thermal detector to operate fan and wash spray in fire condition, upon signal from fusible link damper.

AVTEC INDUSTRIES INC. 120 KENDALL POINT DR. OSWEGO, IL 60543 FAX (630) 851-5777

AVTEC'S policy of continuous product im[illegible] includes the [illegible] to change specifications without notice.

MANUAL

# FIRE SUPPRESSION SYSTEMS DATA SHEET

# SPECIFICATIONS MODEL R-102

### Total System

The restaurant fire suppression system shall be the pre-engineered, liquid agent, cartridge-operated type with a fixed nozzle agent distribution network. It shall be listed with Underwriters Laboratories, Inc. (UL).

The system shall be capable of automatic detection and actuation with local or remote manual actuation. Accessories shall be available for mechanical or electrical gas line shut-off applications.

The system shall have fire suppression capabilities for the following restaurant hazard areas: ventilating structures including hoods, ducts, plenums, and filters; deep-fat fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, or gas-radiant char-broilers.

A system owner's manual shall be available containing basic information pertaining to system operation. A detailed technical manual shall be supplied including system description, design, installation, recharge, and maintenance procedures, plus accessory installation and reset instructions.

The manufacturer shall provide services through a network of authorized distributors.

### System Equipment

**Agent** – The extinguishing agent shall be a potassium carbonate, potassium acetate-based formulation designed for flame knockdown and securement of grease-related fires. It shall be available in plastic containers with instructions for liquid agent handling and usage.

**Tank and Bracket** – The liquid agent storage tank shall be stainless steel with a three gallon (11.4 L) capacity. The shell assembly shall meet the following pressure test requirements: 100 psi (690 kPa) working pressure, 300 psi (2069 kPa) test pressure, 600 psi (4137 kPa) minimum burst pressure.

The tank shall include an adaptor/tube assembly. The adaptor shall be chromium-plated steel with a 1/4-18 NPT female inlet and a 1/2-14 NPT male outlet. The pick-up tube shall be 304L stainless steel - 1/2 in. O.D. by .028 wall.

A welded steel bracket shall be provided for mounting the tank in a minimum amount of space. The agent tank shall be secured with hinged bracket bands.

**Discharge Nozzles** – Each discharge nozzle shall be tested and listed with the restaurant system for specific applications. Nozzle placement shall be determined by the size of the orifice in the nozzle tip. The nozzle tip shall be brass or chromium-plated brass, and stamped with the part number and flow rating. The nozzle tip retainer and body shall be chromium-plated brass. The nozzle strainer shall be brass with stainless 50 mesh screen. Each nozzle tip shall be covered by a protective blow-off cap.

**Regulated Release Mechanism** – The regulated release mechanism shall be the spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks, depending on the capacity of the nitrogen cartridge used. It shall contain a factory-installed regulator deadset at 100 psi (690 kPa) with an internal relief of approximately 130-150 psi (896-1034 kPa). In the "armed" position, the main spring force to the puncture pin piston shall be 150 lb. (68 kg). The mechanism shall have a visual indicator of the cocked or fired condition without having to open the enclosure.

The regulated release mechanism shall have the following actuation capabilities: automatic actuation by a fusible link detection system; remote manual actuation by a mechanical pull station; local manual actuation by a push button located at the front of the release mechanism enclosure.

The regulated release mechanism shall be housed in a chromium-plated 16 ga. sheet steel enclosure with cover. The enclosure shall contain knock-outs for 1/2 in. conduit. The cover shall contain openings for the push button and visual indicator.

The regulated release mechanism shall be compatible with mechanical gas line shut-off devices; or, when equipped with a field or factory-installed solenoid and switch, it shall be compatible with electric gas line or appliance shut-off devices.

**Detection System** – The regulated release mechanism shall be compatible with a fusible link detection system.

The fusible link shall be selected and installed according to the operating temperature in the ventilating system. The fusible links shall be rated as follows:

| Fusible Link Temperature Rating | Use Where Operating Temperature Does Not Exceed |
|---|---|
| 280 °F (130 °C) | 225 °F (107 °C) |
| 360 °F (182 °C) | 290 °F (143 °C) |
| 450 °F (232 °C) | 360 °F (182 °C) |
| 500 °F (260 °C) | 400 °F (204 °C) |

The fusible link shall be supported by a detector bracket/linkage assembly. The detector bracket shall be 16 ga. cold-rolled stainless steel. The detector linkage shall be 20 ga. cold-rolled stainless steel.

The detector bracket/linkage assembly shall have provisions for connecting 1/2 in. rigid or EMT thin-wall conduit, and 1/16 in. (1.6 mm) diameter flexible stainless steel rope. Changes in the direction of the conduit and steel rope shall be accomplished with die cast aluminum alloy, 90° pulley elbows.

### Accessory Equipment

The following accessory equipment shall be available, and shall be compatible with the liquid agent restaurant fire suppression system.

**Remote Manual Pull Station** – If the release mechanism is not accessible for manual actuation, a remote manual pull station shall be provided as the primary means of manual actuation. The pull station shall be the glass break-rod type, and shall be connected to the release mechanism trip lever by means of a 1/16 in. (1.6 mm) diameter stainless steel rope and 1/2 in. conduit. The pull station shall be located at a distance of not more than 125 ft. (38 m) from the release mechanism. The mounting height of the pull station shall be in accordance with the authority having jurisdiction.

**Mechanical Gas Line Shut-Off Valve** – A UL listed, mechanical gas valve shall be provided when automatic gas line shut-off is required for indoor applications. It shall be adapted to the release mechanism cartridge receiver by means of a pneumatic piston-type air cylinder. The valve shall have resilient seating

steel internal parts. It shall be a two-way, normally-open valve requiring 4-15 lb. (1.8-6.8 kg) of pull force to trip. The valve (3/4 to 2 in.) shall have an external visual indicator of the closed or open position.

**Electric Gas Line Shut-Off Valve** – A UL listed, electric gas valve shall be provided when an electrical means of gas line shut-off is required for indoor applications. The gas valve shall incorporate an electric snap-action switch and a manual reset relay with its electric circuit for 110 VAC, 50/60 Hz or 24 VAC, 50/60 Hz. In 24 VAC applications, a transformer with the appropriate voltage rating shall be provided. The gas valve shall be constructed of aluminum with an operating temperature range of 32 °F to 120 °F (0 °C to 49 °C).

**Electric Switch** – A UL listed, electric snap-action switch shall be provided to shut off electrical power to appliances, or to activate electrically-operated devices. Depending on the application, the switch shall be either single-pole, double-throw; double-pole, double-throw; or four-pole, double-throw. The switch shall have a rating of 15 amps, 1/3 hp, 125 or 250 VAC with 1/2 amp at 125 VAC, or 1/4 amp at 250 VAC. A relay shall be supplied if the equipment load exceeds the rated capacity of the switch.

**Pressure Switch** – A UL listed, pneumatically-operated switch shall be provided to shut off electrical power to appliances, or to activate electrically-operated devices. The switch shall be connected to the release mechanism cartridge receiver utilizing 1/8 in. copper tubing and fittings. Depending on the application, the switch shall be single-pole, double-throw or double-pole, double-throw. The switch shall have a rating of 15 amps - 125, 250, or 480 VAC with 10 hp at 125 VAC "L", 1 hp-115 VAC, 2 hp-230 VAC; 1/2 amp at 125 VAC; or 1/4 hp at 250 VAC. A relay shall be supplied if the equipment load exceeds the rated capacity of the switch.

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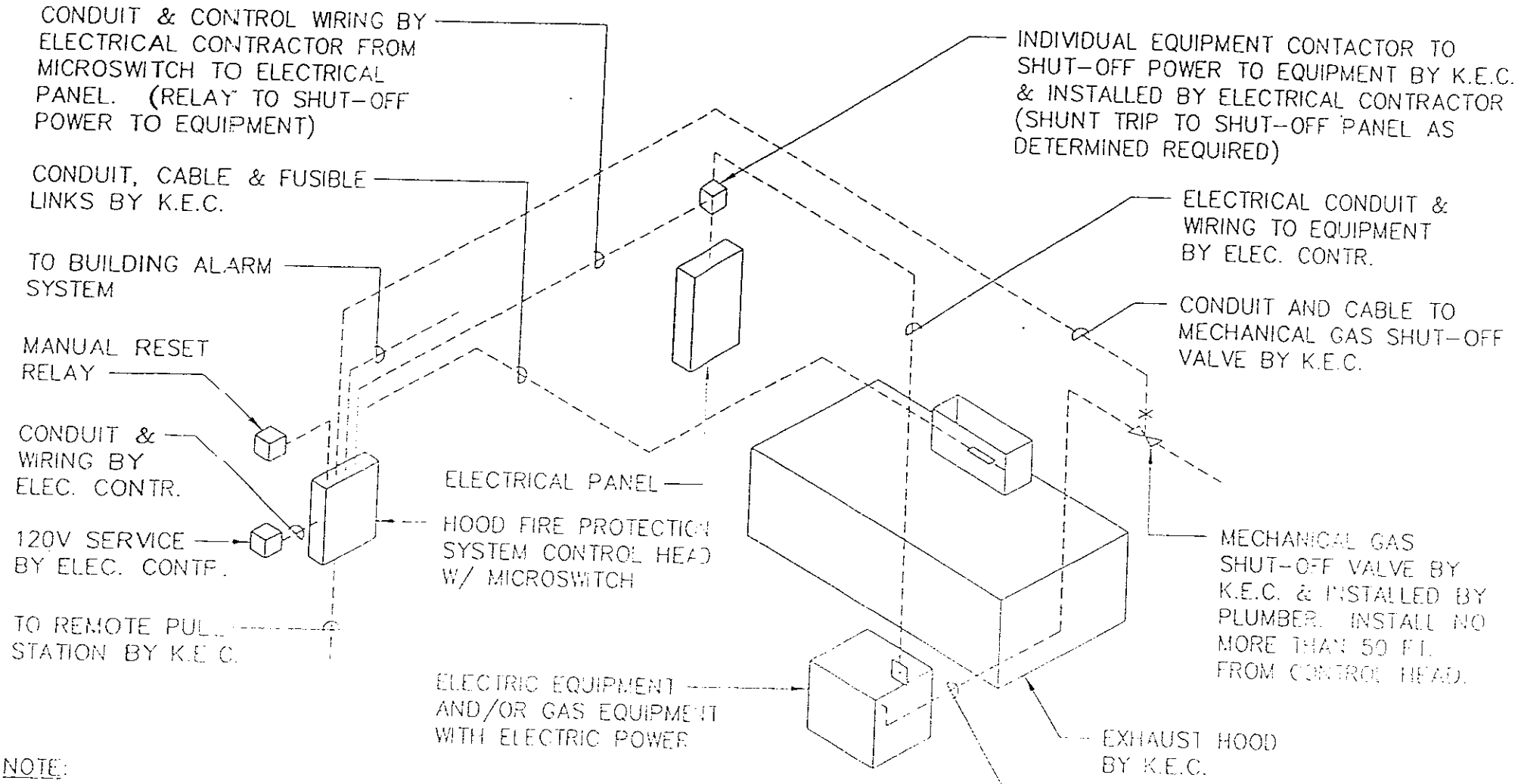



NOTE:
ALL ELECTRICAL POWER TO EQUIPMENT UNDER HOOD ARE REQUIRED TO BE SHUT-OFF ONCE SYSTEM IS ACTIVATED. VERIFY REQUIREMENTS WITH APPROVED MANUFACTURER'S SHOP DRAWINGS

# HOOD FIRE PROTECTION WIRING DIAGRAM

NOT TO SCALE

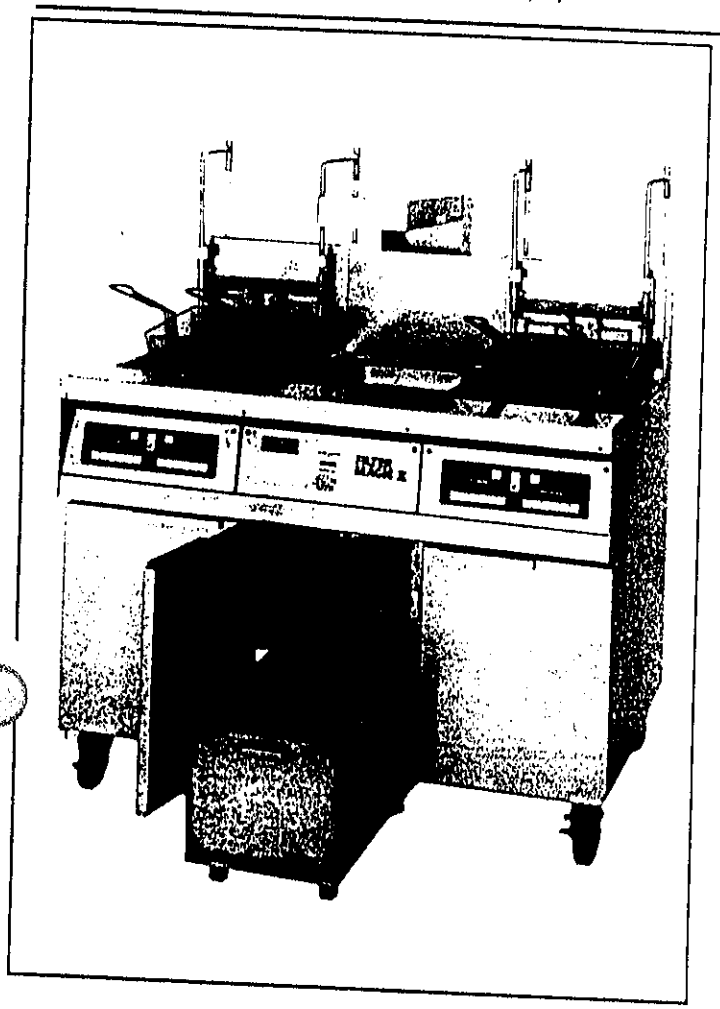
#C11

ITEM NO. #C12

Frymaster

A WELBILT Company

# FILTER MAGIC® SYSTEM
## For Gas and Electric Fryers
### MJH50, MJ35G, MJ45E, MJCFE, G18FB, G24FB, H14, H17, H22, H14TD, H17TD, H22TD



- Extends shortening life
- Fast, safe, easy to operate
- Automatic, hands-off filtration
- Convenient built-in, full-sized or undercounter filter cabinet

The Frymaster Filter Magic® System is specifically designed to extend shortening life. Filter Magic® does it fast, safely, simply; reducing operating costs and yielding a more consistent, higher-quality product.

Fifty pounds (28 litres) of oil can be automatically filtered completely in about three minutes, while other fryers in the system are still in use. Any fryer in the battery can be filtered without moving the filter from fryer to fryer.

The process is as easy as: 1. Switch off the fryer; 2. Open drain valve; 3. Start filter pump. No special training required, nothing hot or messy to handle. Filter Magic® automatically filters oil as Frymaster's exclusive Power Shower™ directs jets of hot oil down every inch of the frypot, flushing crumbs and sediment into the filtering system. After filtering, fresh oil is automatically pumped back into the frypot.

Filter Magic® is available in full-sized and undercounter cabinets that can be batteried to either side of most Frymaster gas and electric fryers. The full-sized cabinet can be purchased with cut-out for optional cafeteria-style or scoop-type pan and a rod-style or bulb-type heat lamp can be mounted to the cabinet, making a complete warming station.

Up to six of the following same Frymaster models can be batteried to each side of the Filter Magic System®: MJH50, MJ35G, MJ45E, H14, H17, H22, H14TD, H17TD. Up to four MJCFE, G18, G24 fryers can be batteried to each side of a Filter Magic System®.

## STANDARD FEATURES

- Power Shower™
- 1/3 H.P. Motor With 5.5 GPM
- Stainless Steel Inner and Outer Filter Pans
- Filter Heater
- Filter Screen
- Crumb Screen

ISO 9002

FRYMASTER L.L.C.
A Welbilt Company
8700 Line Avenue, P.O. Box 51000 Shreveport, Louisiana U.S.A. 71135-1000 Phone 318-865-1711
TOLL FREE 1-800-221-4583 Fax 318-868-5987
*Distributed in Canada by GARLAND COMMERCIAL RANGES, LTD., 1177 Kamato, Mississauga, Ontario L4W 1X4.*

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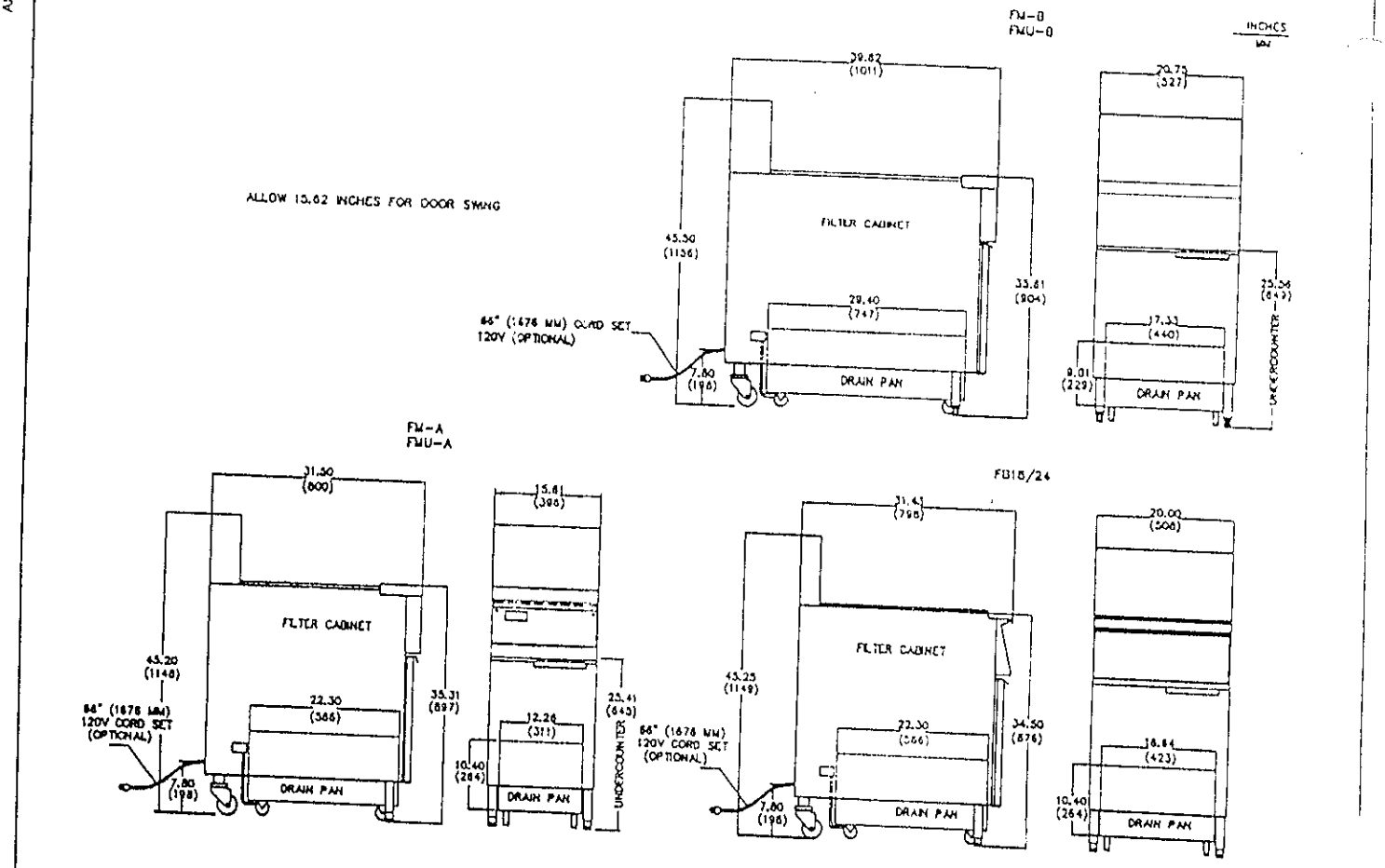
# FILTER MAGIC® SYSTEM FOR GAS AND ELECTRIC FRYERS




## DIMENSIONS FOR FILTER ONLY

| MODEL NO. | SHORTENING CAPACITY | SIZE | | | NET WEIGHT | SHIPPING INFORMATION | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HEIGHT | WIDTH | LENGTH | | WEIGHT | CLASS | CUBE | HEIGHT | WIDTH | LENGTH |
| FM-A | 50 lbs. (28 Litres) | 45.20" (1148 mm) | 15.61" (396 mm) | 31.50" (800 mm) | 95 lbs. (43 kg) | 125 lbs. (57 kg) | 85 | 21.31 cu. ft. | 46.50" (1181 mm) | 22" (559 mm) | 36" (914 mm) |
| FM-B | 80 lbs. (44 Litres) | 45.50" (1156 mm) | 20.75" (527 mm) | 39.82" (1011 mm) | 115 lbs. (52 kg) | 150 lbs. (68 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |
| FMU-A Undercounter | 50 lbs. (28 Litres) | 25.41" (645 mm) | 15.61" (396 mm) | 31.50" (800 mm) | 80 lbs. (36 kg) | 110 lbs. (50 kg) | 85 | 19.48 cu. ft. | 42.50" (1080 mm) | 22" (559 mm) | 36" (914 mm) |
| FMU-B Undercounter | 80 lbs. (44 Litres) | 25.56" (649 mm) | 20.75" (527 mm) | 39.82" (1011 mm) | 90 lbs. (41 kg) | 125 lbs. (57 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |
| FB18/24 | 50-64 lbs. (28-36 Litres) | 45.25" (1149 mm) | 20.00" (508 mm) | 31.43" (798 mm) | 105 lbs. (48 kg) | 145 lbs. (66 kg) | 85 | 31.96 cu. ft. | 47" (1194 mm) | 25" (635 mm) | 47" (1194 mm) |

## HOW TO SPECIFY

**FM-A** Full sized Filter Magic system to battery with MJH50, MJ35G, MJ45E, H14, H17, H22, EPH14, EPH17

**FM-B** Full sized Filter Magic system to battery with MJCFE

**FMU-A** Undercounter Filter Magic system to battery with MJH50, MJ35, MJ45E, H14, H17, H22, EPH14, EPH17

**FMU-B** Undercounter Filter Magic System to battery with MJCFE

**FB18/24** Full sized Filter Magic System to battery with G18FB and G24 FB

FILTER MAGIC CABINET CAN BE LOCATED ANYWHERE IN THE BATTERY --PLEASE SPECIFY.

### OPTIONAL ACCESSORIES

- ☐ Rod-style heat lamp assembly
- ☐ Bulb-style heat lamp assembly
- ☐ Cafeteria-style dump pan
- ☐ Perforated scoop-type dump pan
- ☐ Filter envelopes
- ☐ Casters
- ☐ Filter cover
- ☐ Stainless steel door, cabinet, sides

### STANDARD ACCESSORIES

- Filter paper (25 Ct.)
- Filter powder (100 1-cup applications)
- Filter brush
- Fryer's friend (cleanout rod)

### NOTES

- Supply voltage for filter is obtained from the line voltage of fryer, except for 480V, which will have a separate 120V, 60Hz (9.0 Amp) power supply cord supplied with unit.
- Control Voltage: 24V, 60Hz
- Export Supply Voltage: 220V, 50Hz (4.5 Amp)
- FB18 and FB24 not available for export
- Filter Magic systems are also available on fryers equipped with computers and/or automatic basket lifters.
- For applications where space is premium, please see Frymaster's FootPrint® Filtration specifications.

FRYMASTER L.L.C.
A Welbilt Company
8700 Line Avenue, P.O. Box 5100, Shreveport, Louisiana U.S.A. 71135-1000 Phone 318-865-1711
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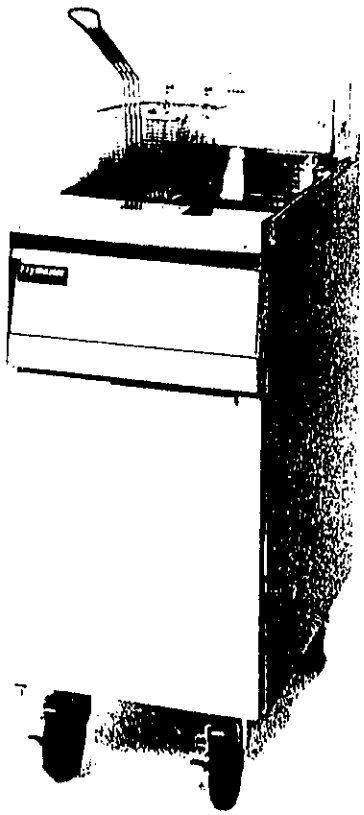
ITEM NO. #C12

# Frymaster®

A WELBILT Company

# MJ35 Gas Fryers

## Specifically designed for all-purpose frying



*Shown with optional casters*

- Open-pot design, no tubes, easy to clean
- Centerline thermostat, two-year limited warranty, quick response to loads, accurate to 1°
- Deep cold zone, 1-1/4 in. (32 mm) IPS ball-type drain valve
- Lifetime limited warranty on stainless frypot
- Multiple orifice burner, no burner tube radiants to burn out, no cleaning or adjusting air shutters

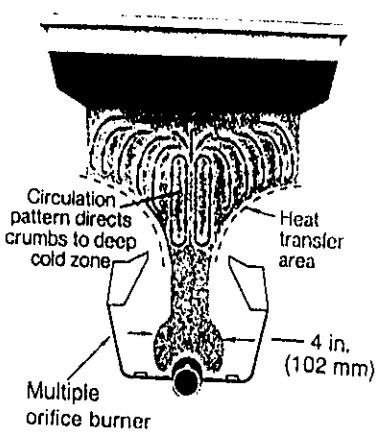
The MJ35 has a minimum 30-lbs. (15 litres)* and maximum 40-lbs. (20 litres)* shortening capacity. The frying area is 12 x 15 in. (305 x 381 mm). This 110,000 BTU (116 megajoules) model is specifically designed for all-purpose frying and produces 65 lbs. of french fries per hour -- frozen to done. The exclusive 1° action thermostat (two-year limited warranty) extends shortening life and produces a more uniformly-cooked product. Centerline thermostat mounting permits quick sensing of cold food placed in either basket. Unique Master Jet burners have no burner tube radiants to burn out. No burner cleaning or air shutter adjustment is required.

The open, stainless steel frypot has a large heat transfer area to fry more product per load. The open-pot design has no hard-to-clean tubes. Every inch of the frypot and cold zone can be cleaned and wiped down by hand.

The large cold zone catches crumbs and sediment from the frying area. These particles are trapped in the cold zone where they do not carbonize, contaminate shortening or cling to fried products.

The MJ35 model uses a millivolt temperature control circuit. The MJ35GBL automatic basket lift motor uses 120V (240V for export). Up to three MJ35 fryers can be batteried to produce a frying station.

*Liter conversions are for solid shortening @70°F.




*Unique frypot design with deep cold zone*

NSF CE AGA ISO 9002

THE FRYMASTER CORPORATION
A Welbilt Corporation
8700 Line Avenue, P. O. Box 51000 Shreveport, Louisiana U.S.A. 71135-1000 Phone 318-865-1711
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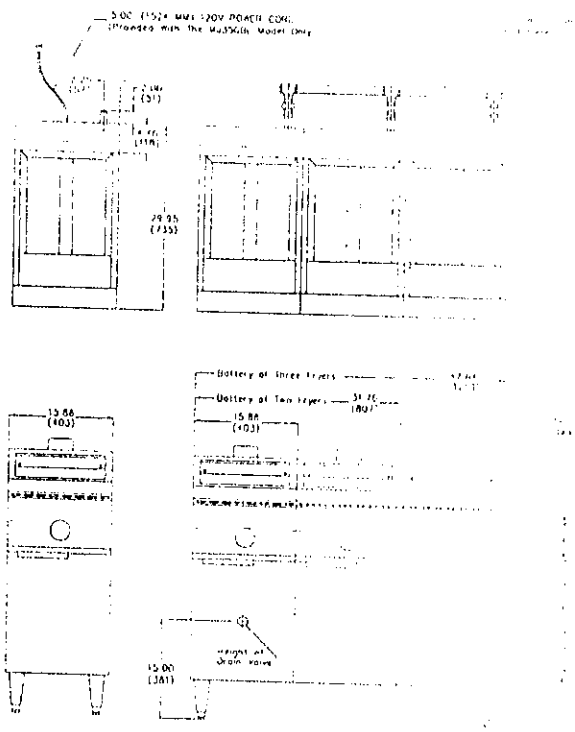
# MJ35 Gas Fryers



## DIMENSIONS

| MODEL NO. | SHORTENING CAPACITY | SIZE HEIGHT | SIZE WIDTH | SIZE LENGTH | DRAIN HEIGHT | NET WEIGHT | SHIPPING INFORMATION WEIGHT | CLASS | CUBE | DIMENSIONS H | DIMENSIONS W | DIMENSIONS L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MJ35 and MJ35G | min.-max. 30-40 lbs. (15-20 litres) | 40.47" (1028 mm) | 15.88" (403 mm) | 29.95" (761 mm) | 12" (305 mm) w/extension | 145 lbs. (66 kg) | 177 lbs. (80 kg) | 85 | 19.47 | 42.50" (1080 mm) | 22" (559 mm) | 36" (914 mm) |
| MJ35GBL | min.-max. 30-40 lbs. (15-20 litres) | 42.29" (1074 mm) | 16" (403 mm) | 29.96" (769 mm) | 12" (305 mm) with extension | 185 lbs. (84 kg) | 233 lbs. (106 kg) | 85 | 19.47 | 42.50" (1080 mm) | 22" (559 mm) | 36" (914 mm) |

## POWER REQUIREMENTS

| MODEL NO. | NATURAL GAS | LP GAS | ELECTRICAL | EXPORT |
|---|---|---|---|---|
| MJ35 | 110,000 BTU input (116 megajoules) (32.2 kW) | 110,000 BTU input (116 megajoules) (32.2 kW) | none required for millivolt system | |
| MJ35G | 110,000 BTU (116 megajoules) (32.2 kW) | 110,000 BTU input (116 megajoules) (32.2 kW) | none required for millivolt system | |
| MJ35GBL | 110,000 BTU (116 megajoules) (32.2 kW) | 110,000 BTU input (116 megajoules) (32.2 kW) | For basket lift operator 120V/60Hz/7 AMPS 120VAC, 5' (1.5m) grounded power cord provided | 240V/50Hz 3-1/2 AMPS |

## NOTES

- 1/2" (NPT) gas inlet size on single fryers.
- 120VAC 5 ft. (1.5m) grounded power cord provided for MJ35GBL only.
- Gas supply line to fryers should be minimum 1/2" for single fryers, minimum 1" for 2 or more fryers in battery. Recommended minimum store manifold pressure to be 6" W.C. for natural gas and 11" W.C for L.P. gas. Check plumbing codes for proper supply line sizing to attain burner manifold pressure of 4" W.C. natural or 9" W.C. L.P.

## CLEARANCE INFORMATION

A minimum of 24" (610 mm) should be provided at the front of the unit for servicing and proper operation, and 6" (152 mm) between the sides and rear of the fryer to any combustible material. A minimum of 18" (457 mm) should be maintained between the flue outlet and the lower edge of the exhaust hood filters.

## HOW TO SPECIFY

| | |
|---|---|
| MJ35 | Millivolt fryer with concealed thermostat knob |
| MJ35G | Millivolt fryer with control panel with exposed thermostat knob |
| MJ35GBL | Automatic basket lift model (2 independent lifts with 0-15 minute timers and thermostat knob on control panel) Standard timers are 0-15 minutes |
| FM*35G | Up to 6 MJ35G fryers in battery with Filter Magic® system. (Filter available in any position. Please specify location.) |
| ST | Plain steel pot -- enamel cabinet (not available in battery) |
| SD | Stainless steel pot and door -- enamel cabinet |
| SC | Stainless steel pot, door and cabinet |

*Insert number of fryers in battery.

## OPTIONAL ACCESSORIES

- ☐ Frypot cover
- ☐ Sediment tray
- ☐ Flexible metal connector with quick-connect coupler
- ☐ Full size basket in lieu of twin baskets
- ☐ Fryer's Friend clean-out rod
- ☐ Screen-type basket support
- ☐ Fishplate
- ☐ 3/4" x 48" (19 x 1219 mm) quick disconnect with gas line and adapter
- ☐ 3/4" x 36" (19 x 914 mm) quick disconnect with gas line and adapter
- ☐ Automatic basket lifts (2 independent lifts with 0-15 minute electric timers)
- ☐ Stainless steel apron drain with basket (interchangeable right or left side)
- ☐ SF (Simmer Fry) hinged frypot cover (not available with MJ35 batteries)
- ☐ 0-15 minute mechanical timer (MJ35G only)

THE FRYMASTER CORPORATION
A Welbilt Corporation
8700 Line Avenue, P. O. Box 51000 Shreveport, Louisiana U.S.A. 71135-1000 Phone 318-865-1711
TOLL FREE 1-800-221-4583 Fax 318-868-5987
*Distributed in Canada by GARLAND COMMERCIAL RANGES, LTD., 1177 Kamato, Mississauga, Ontario L4W 1X4*

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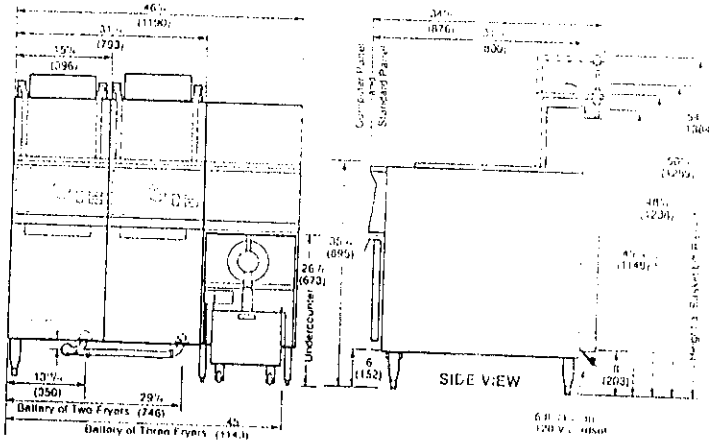
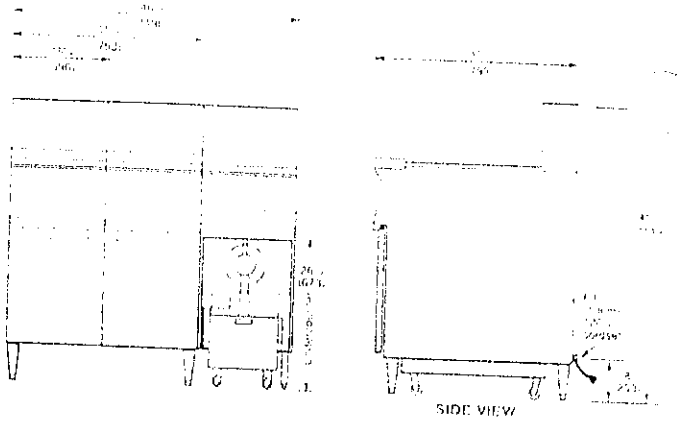
We reserve the right to change specifications appearing in this bulletin with

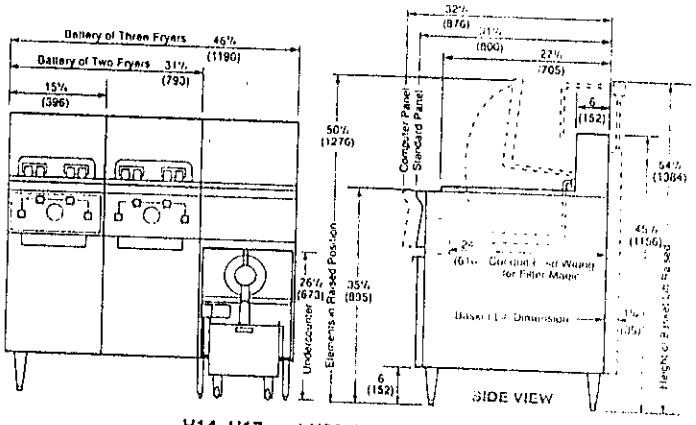
FILTER MAGIC® II FILTRATION SYSTEMS



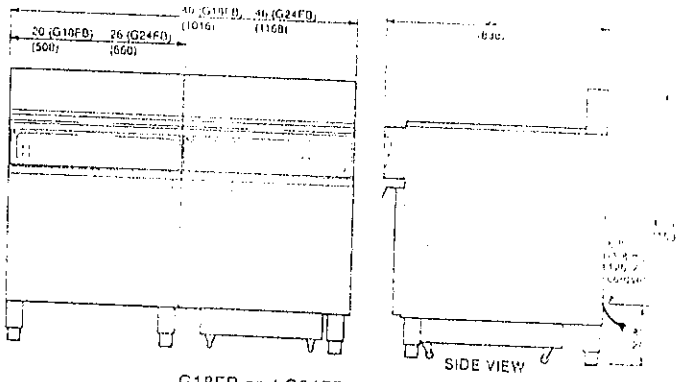

MJ45E and MJH50 FILTER SYSTEM



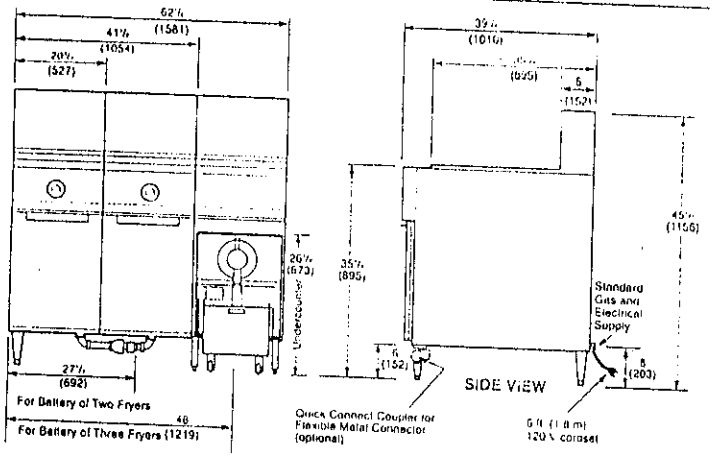

MJ235 FILTER SYSTEM




H14, H17 and H22 FILTER SYSTEM




G18FB and G24FB FILTER SYSTEM*




MJCFE FILTER SYSTEM

## NOTES

1. *FILTER MAGIC® II available with the following models: MJH50, MJ45E, MJ35, MJCFE, H14, H17, H22, G18FB, G24FB (G18FB and G24FB not available for export).*
2. *With Filter Magic, filter can be located anywhere in the battery — please specify.*
3. *FOOTPRINT™ FILTER SYSTEM available with the following models: MJH50, H14, H17 (not illustrated).*
4. *Filter drawer will always be located under the left two fryers in any battery with up to six FootPrint units.*
5. *Filter Magic® II Systems are also available on fryers equipped with computers and/or automatic basket lifters.*
6. *Casters and quick disconnect gas lines optional.*
7. ***Please see individual engineering specification sheets for details on individual fryers.***

inches
mm

**Frymaster®**

A WELBILT Company

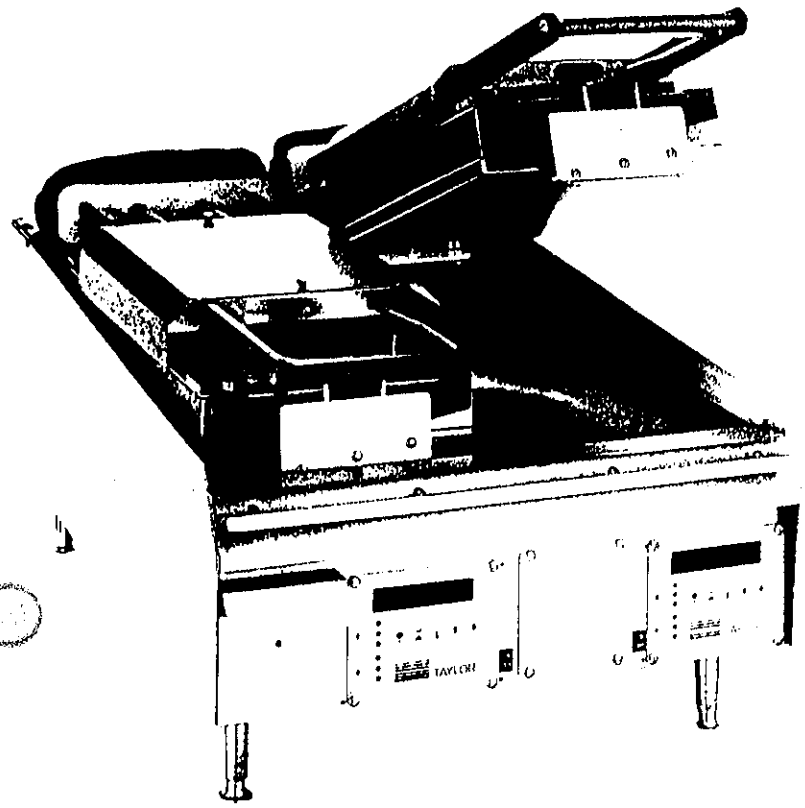
8700 Line Avenue, P.O. Box 51000,
Shreveport, Louisiana U.S.A. 71135-1000,
Phone 318-865-1711, Fax 318-868-5987
Call Toll free 1-800-221-4583

Frymaster Corporation

C13

# Model QS24

Single Platen




The Taylor Model QS24, compact, countertop flat or clamshell grill is designed to deliver fresh, cook-to-order menu items...fast! The two sided cooking method is the reliable solution to increase speed of service, reduce product waste, and assure safe product integrity. And when multiple grills are installed side by side, cooking surface and capacities are greatly increased.

This modular design includes two independent 12" (30.5 cm.) wide cooking zones and one or two 11" (27.9 cm.) optional upper platens. The two-sided, contact cooking concept will cook the top and bottom of the product simultaneously. Product will be cooked-to-order and served to the customer in the least amount of time. And the grill responds quickly, returning to preset temperatures every time fresh or frozen foods are added to the grill surface.

Complete your menu with reliable equipment from Taylor — the new QS24, clamshell grill.

## QS (Quick Self) Quiz

Do you want to serve cooked-to-order products FAST? Yes No

Are quick recovery and reliable cooking temperatures, even during your busiest times important to your business? Yes No

Are you concerned that every grilled product served has achieved the proper internal temperature necessary for product safety? Yes No

**If you answered yes to one or more of these questions, the QS24 offers the solution.**

TAYLOR®

The Taylor world-wide distributor network offers the most complete line of equipment, factory trained service technicians, full parts inventory, merchandising programs, financing, and leasing capabilities to meet your needs. Your local distributor is a Taylor professional who can assist in planning your menu.

# Model QS24

## FEATURES

**Cooking Surface**
Two, 12" (30.5 cm.) wide, 24" (61.0 cm.) deep cook areas, 3 independent heating elements for each 12" (30.5 cm.) of cook surface width. Assures even temperatures and quick recovery.

**Control Board**
Programmable microprocessor controls makes menu selection simple and includes a self-diagnostic feature for serviceability.

**Temperature Controls**
Two individual temperature controls can be set from 150°- 425°F (65.5°- 218.3°C). Left and right side operate independently for menus that require items with varied temperatures.

**Indicator Light**
Lights illuminate when heaters are ON.

## OPTIONS

The modular design can be ordered as a flat grill, one upper platen or two. If one upper platen is required, it can be located on either the left or right hand cook surface.

**Upper Platen (optional)**
Each platen has a cooking surface of 11" x 20" (27.9 cm. x 50.8 cm.). Three individually controlled heaters. Platen can be positioned from 30° to a maximum angle of 60° from cooking surface to accommodate various height locations of existing hood.

**Release Material**
Release material completely covers and protects upper platen cooking surface. Attachment ensures that the release material stays in place throughout the day for easy cleaning and will minimize carbon build-up.

## SPECIFICATIONS

**Clearance**
3" (7.6 cm.) from all combustible materials and 3" (7.6 cm.) of air clearance in rear.

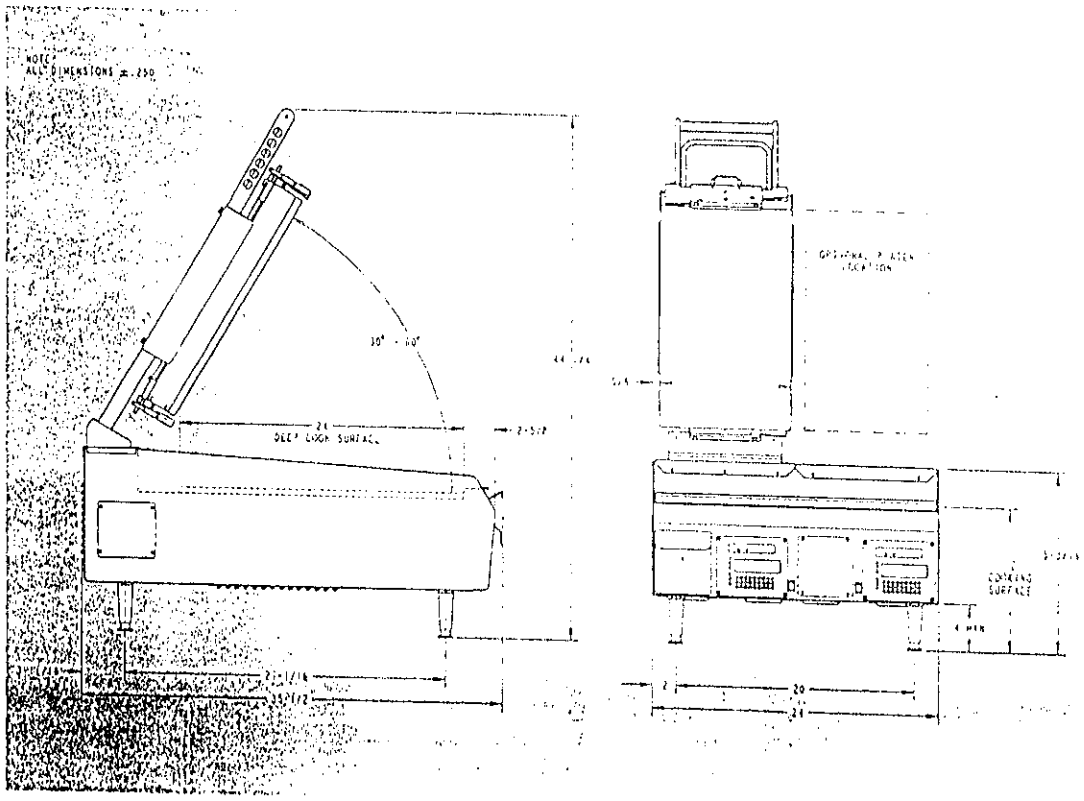
**Dimensions**
Width: 24" (60.9 cm.)
Depth: 35-1/2" (90.2 cm.)
Height: 15-1/4" (38.7 cm.) to top of back splash. 20" (50.8 cm.) with optional upper platen lowered.
Counter Clearance: mounted on 4" (10.2 cm.) adjustable legs.

| Electrical | One dedicated connection. | | |
|---|---|---|---|
| Voltage | Option | Total Amps | KW |
| 208/60/3 | Flat | 23 | 8.4 |
| 208/60/3 | One Platen | 37 | 12.6 |
| 208/60/3 | Two Platens | 46 | 16.8 |
| 240/60/3 | Flat | 20 | 8.4 |
| 240/60/3 | One Platen | 30 | 12.6 |
| 240/60/3 | Two Platens | 40 | 16.8 |

Available in electric only. Other electrical characteristics are available. (For exact electrical information, always refer to the data label of the unit.)

**Weights**
**Flat**
Net: 210 lbs. (95.3 kgs.)
Crated: 275 lbs. (124.7 kgs.)
**One Platen**
Net: 305 lbs. (138.3 kgs.)
Crated: 370 lbs. (167.8 kgs.)
**Two Platens**
Net: 400 lbs. (181.4 kgs.)
Crated: 465 lbs. (210.9 kgs.)
22.0 cu. ft. (0.62 cu. m.)

Availability and specifications subject to change without notice.




Taylor Company
Rockton, Illinois 61072

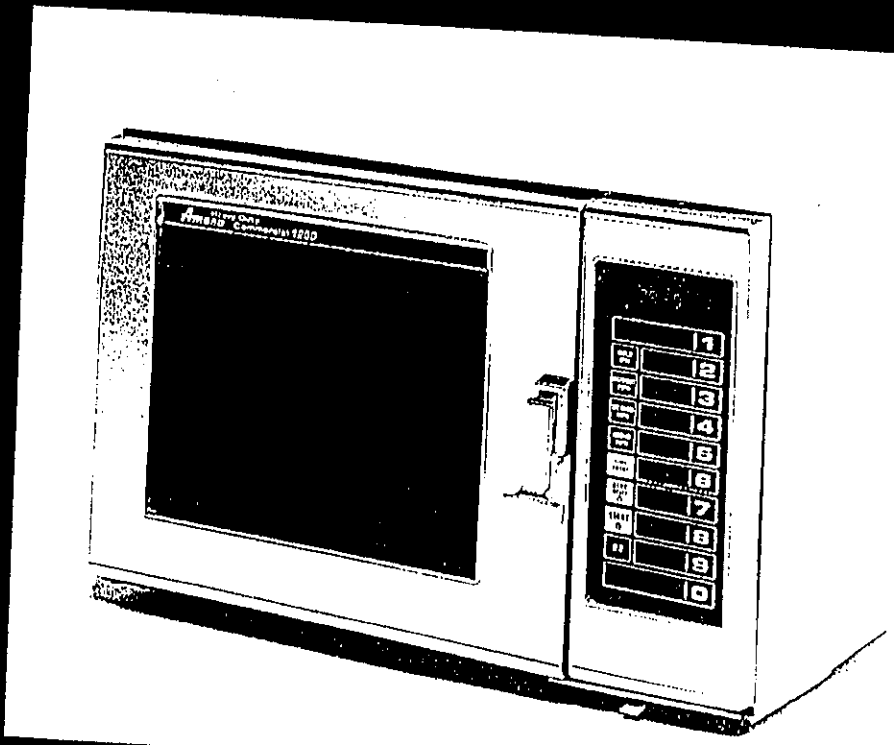
NSF Standard 4

#015

Radarange
COMMERCIAL MICROWAVE

# RFS12MPS

1200 WATTS



## High Volume, Full-Featured

- Largest capacity in its class
- Five power levels and X2 double quantity feature
- Easy-to-clean, easy-to-own
- Full 3-year warranty

ISO•9001

WORLD CLASS QUALITY

HIGH PERFORMANCE HAS A NAME™

Amana Radarange
COMMERCIAL MICROWAVE OVENS

# RFS12MPS
## 1200 WATTS

# An Amana Classic: Heavy Duty Stainless Steel, Full Sized, Full-Featured.

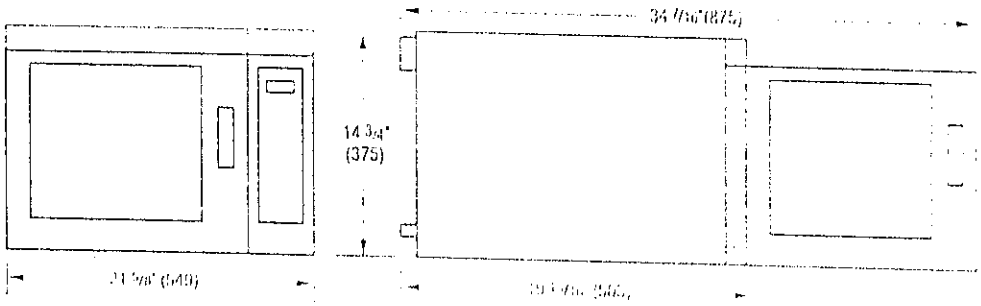
- **Versatile Value**
  Amana's RFS series of ovens feature the largest capacity in their class. A large 1.2 cubic foot interior and a superior cooking pattern allow you to prepare a greater variety of menu items.
- **Durable and Dependable**
  This series is designed for use in most medium to high volume foodservice locations. A stainless steel interior and exterior and a heavy duty interlock switch are only two reasons the RFS series has a strong and loyal following.
- **Unbeatable Security**
  A full 3-year warranty on parts, labor and travel provides maximum protection and is backed by over 700 fully trained and factory authorized service contractors across North America.
- **Easy-to-Clean**
  Our exclusive sealed-in shelf is only one example why Amana Commercial products are easy-to-maintain, easy-to-use and easy-to-own.
- **Double the Simplicity**
  A X2 quantity pad simplifies operation and training and improves product quality consistency when preparing more than one order at a time.
- **Easy-to-Train, Flexible Menu**
  Programmable selection of up to 100 menu items ensures fast, consistent operation. Pads can be preset by power level and time for fast, consistent operation. 5 power levels, from full power to hold, provide flexibility for heating a wide variety of food items from frozen to fresh.

Toll Free
1-800-843-0304
In Canada, call
905-567-5200

Model RFS12MPS — Heavy Duty Stainless Steel Microwave Oven

| Cabinet | Exterior Dimensions in (mm) | Usable Interior Dimensions in (mm) |
|---|---|---|
| Height | 14 3/4" (375) | 9 1/2" (241) |
| Width | 21 5/8" (549) | 13 1/2" (343) |
| Depth (overall) | 19 13/16" (503) | 15 11/16" (398) |
| Depth (door open 90°) | 34 7/16" (875) | |
| Usable Cavity Space (liters) | | 1.2 cu. ft. (34) |
| **Electrical Characteristics** | | |
| Output Power (watts nominal)* | 1200 | |
| Power Required | 120V, 60 Hz, 20A | |
| Watt Input | 2,000 watts | |
| Frequency | 2,450 MHz | |
| Power Cord (m) | 5' (1.5) | |
| Plug Configuration | 5-20 | |
| **Weight** | | |
| Approximate Shipping (kg) | 68 lbs. (31) | |
| **Warranty** | | |
| 3 years, full. | | |

Amana's continuing commitment to quality products may mean a change in specifications without notice.
* Microwave output power ratings based on IEC 705 test




TO SPECIFY AN AMANA RFS12MPS COMMERCIAL RADARANGE MICROWAVE OVEN:
Oven shall be certified to have been designed and tested for compliance to the applicable U.S. Government Department of Health and Human Services performance standards for microwave ovens. Electrical controls for the oven shall consist of a touch control panel featuring single and multiple program preset timing methods, variable entry timing, five power levels and time programming options. Programming shall be all electronic and shall not require tools. There will be no need to pull out the timer panel, match wires and post or adjust screws. There shall be 10 numbered pads, a digital readout display and START, STOP/q 62RESET, TIME ENTRY, DEFROST, HOLD, MED-HI, MEDIUM power and X2 pads. The oven shall have "instant-on" operation to provide microwave energy for the entire time selected. A "Permanent" memory shall lock in programming instructions even if power is disconnected for years. No batteries shall be used. There shall be built-in thermal protection. Oven interior shall be of top feed design with an enclosed rotating microwave antenna that distributes microwaves evenly. The side-swing door will have a see through window and shall be intrusion-proof with a slotted chase seal plus 3 interlock safety switches. Oven shall meet the standards and carry labels of NSF, U.L., and CSA. Oven shall have a five-foot power cord with 3-prong plug. Oven shall have a three-year warranty.

Form No. ACRR9570
Printed in the U.S.A.

Amana
HIGH PERFORMANCE HAS A NAME
www.amanacommercial.com

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Amana, Iowa 52204

**Delfield**
A WELBILT COMPANY

ITEM NUMBER _____ #011
QUANTITY _____ DATE _____
APPROVAL _____

# 4460N/D4460N

## Front-Breathing Self-Contained Compact Salad Top Refrigerators

### Short Form Specifications

**Exterior top** is one-piece 22-gauge stainless steel with integral 2.12" (5.1cm) square nosing at the front. Top has openings to accept 8 or 12 1/6-size 4"- 6" (10.2cm - 15.2cm) deep plastic pans. Adapter bars and 1/6 pans are supplied by Delfield. Temperature in top opening to maintain 33°F (1°C) to 41°F (5°C), with pans recessed 2.5" (6.4cm) at 86°F ambient room temperature, meeting NSF 7 requirements. One 60" x 10" x .5" (152cm x 25.4cm x 1.3cm) plastic cutting board is mounted on the the top at the front edge.

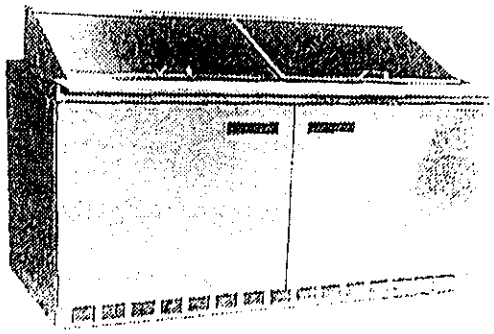
**Exterior back and bottom** are two-piece 24-gauge galvanized steel. Exterior ends are stainless steel.

**Interior sides** are thermoformed ABS plastic with shelf supports. Base is fully insulated with high-density foamed in place polyurethane.

**Refrigeration system** uses HFC-404A refrigerant. Compressor is 1/2 H.P., with condenser coil and condensate evaporator mounted on rear of the cabinet. Evaporator coils and temperature control are located on the interior rear wall of the cabinet. Refrigerant flow is controlled by a capillary tube. Cabinet maintains an interior cabinet temperature of 36°F to 40°F (2°C to 4°C).

**Electrical connections** are 115 volt, 60 Hertz, single phase. Unit has an 8' (2.4m) long electrical cord and NEMA 5-15P plug.

**Casters:** Equipment is mounted on 2" (5.08cm) diameter casters, with front three locking. Equipment clearance above the floor is 2.5" (6.35cm).



Model 4460N-12

### The following applies to two door models only

Doors have a 22-gauge stainless steel exterior, with thermoformed ABS plastic interior liner. Cabinet has one adjustable epoxy-coated wire shelf per door opening.

### The following applies to four drawer models only

Drawer fronts have a 22-gauge stainless steel exterior, with thermoformed ABS plastic interior liner. Drawer frames and slides are 14-gauge stainless steel, with stainless steel bearings. Each section has two drawers. Each top drawer holds one full size 12" x 20" (30.5cm x 50.8cm) pan 4"- 6" (10.6cm - 15.2cm) deep. Each bottom drawer holds one 12" x 20" (30.5cm x 50.8cm) pan 4" (10.6cm) deep. Pans supplied by others.

### Optional Accessories and Modifications

- Flat lift off covers
- 4" x 2" stainless steel backsplash
- 18" wide single tier overshelf
- Stainless steel back
- Plastic laminate on front
- Additional wire shelves
- Door lock
- *220V/50 Hertz electrical system

*Inclusion of this option will alter electrical specifications of the unit.

404A REFRIGERANT

Designs included in this equipment may be covered under one of the following patents: (5,461,878) (5,532,456) (5,282,367) (5,363,672)

Built To NSF 7 Standards


**The Delfield Company**
Post Office Box 470 • Mount Pleasant, Michigan 48804-0470
(517) 773-7981 • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com



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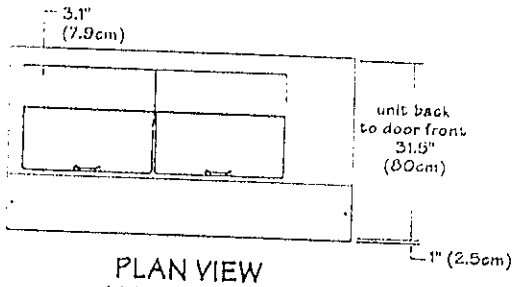
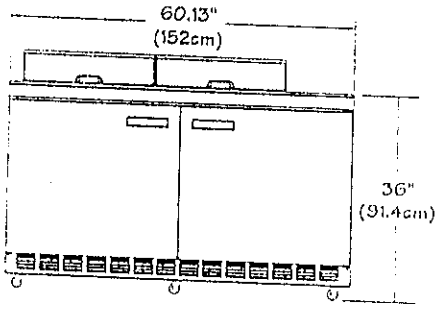
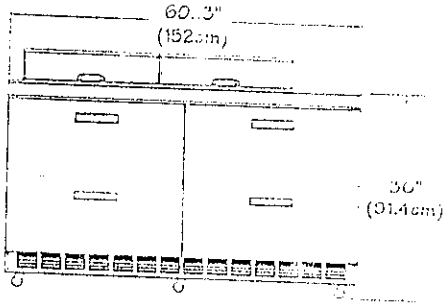
# Front-Breathing Self-Contained Compact Salad Top Refrigerators




PLAN VIEW
ALL MODELS



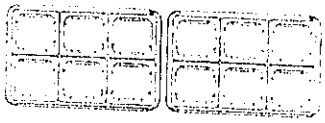

ELEVATION VIEW
ALL DOOR MODELS




ELEVATION VIEW
ALL DRAWER MODELS

## 1/6 SIZE PAN CONFIGURATIONS

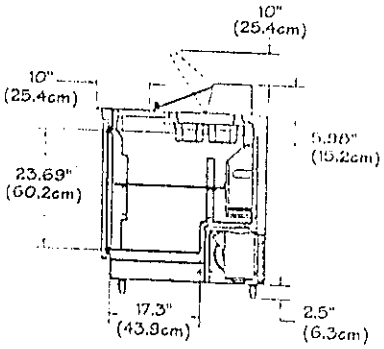
4460N-8/D4460N-8



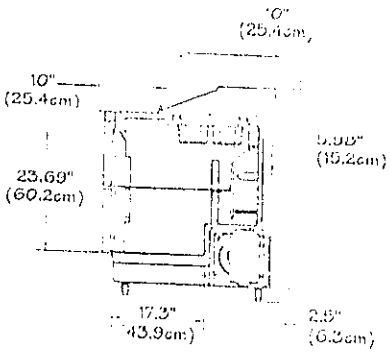
4460N-12/D4460N-12

DRAWER CLEARANCE IS: 22.5" (57cm)
DOOR CLEARANCE IS: 30" (76cm)

INSTALLATION NOTE:
Refrigeration system is designed so that air will flow under the unit, through the compressor area and out the front of the unit. Any restriction to this air flow path will void the warranties.




END VIEW
ALL DOOR MODELS




END VIEW
ALL DRAWER MODELS

## Mechanical Data–Standard Unit

| MODEL NUMBER | 1/6 SIZE PAN CAPACITY | # OF SHELVES | SHELF AREA, SQ. FT. | STORAGE CAP. CU. FT. | H.P. | VOLTS/HERTZ/PHASE | AMPS | NEMA PLUG | SHIP WEIGHT |
|---|---|---|---|---|---|---|---|---|---|
| **4460N-8** | 8 | 2 | 7.36 | 15.7 | 1/2 | 115/60/1 | 12.0 | 5-15P | 345 lbs/ 156 kg |
| **D4460N-8** | 8 | N/A | N/A | 2.7 | 1/2 | 115/60/1 | 12.0 | 5-15P | 450 lbs/ 204 kg |
| **4460N-12** | 12 | 2 | 7.36 | 15.7 | 1/2 | 115/60/1 | 12.0 | 5-15P | 345 lbs/ 156 kg |
| **D4460N-12** | 12 | N/A | N/A | 2.7 | 1/2 | 115/60/1 | 12.0 | 5-15P | 450 lbs/ 204 kg |

**The Delfield Company**
Post Office Box 470 • Mount Pleasant, Michigan 48804-0470
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# Ranserve HTD Series Hot Food Well Units

Randell

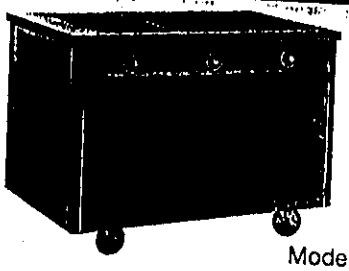
RanServe By Randell

PROJECT # C17

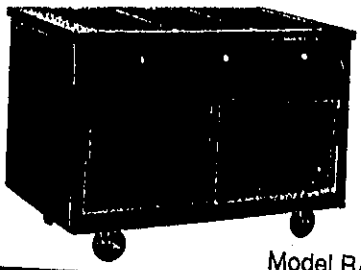
ITEM # QTY.

DATE

## Hot Food Well Units



Model RAN HTD-3



Model RAN HTD-3S

Portable, stainless steel heated serving station. Individually and thermostatically controlled 12" x 20" die-stamped hot food wells with drains and gate valve. Available in enclosed, dry storage or heated bases. Interchangeable stainless steel, or laminate body panels, snap together locking device designed to work with all other Ranserve equipment. Provided with 4 swivel casters-(2) locking.

## Models ■ HTD Series ■ HTD "S" Series ■ HTD "B" Series

### STANDARD FEATURES:

- Thermostatic control for precise food temperatures.
- Die-stamped raised sanitary rim pan oponings.
- Interchangeable body panels.
- "Bayonet" locking system to align and hold unit together with other Ranserve units if needed.
- 1" drain, manifold, and ball valve.
- Swivel casters - (2) locking.

MODELS

RAN HTD-2
RAN HTD-3
RAN HTD-4
RAN HTD-5

RAN HTD-2S
RAN HTD-3S
RAN HTD-4S
RAN HTD-5S

RAN HTD-2B
RAN HTD-3B
RAN HTD-4B
RAN HTD-5B

### SPECIFICATIONS:

**UNIT TOP:** Top to be one piece of die-formed 16 gauge stainless steel with 1 1/2", 90° nosing on all sides. 12" x 20" top openings with raised die-stamped perimeters.

**FOOD WELLS:** Unit fitted with complement of 12" x 12" x 6 1/2" electrically heated food wells, individually and thermostatically controlled. 1" drains, drain manifold and common ball valve installed as standard - drain lines run to accessible area.

**UNIT BODY:** HTD Series (Buffet style with enclosed base); One end of unit to be fitted with female, spring loaded openings and the other end to be fitted with male " bayonet" fittings to align and hold units in place when two or more modular units are joined. Body frame to be all welded construction of steel with exposed corners to be 1 1/4" stainless steel. All corners welded and polished. Body ends and panels to be plastic laminate with galvanized steel backing (specify laminate color). Body ends and panels to be removable to allow the changing of colors. Unit to be equipped with 4 swivel casters, (2) locking, that are recessed inside of toe area. Unit shipped with 9'- cord & plug installed.

**CONTROLS:** Controls mounted on front of recessed stainless steel panel. Connections to heating elements to be located outside of heated zone to avoid wiring deterioration. Individual food wells wired to a common junction box(es). 120, 208, or 240V operation.

**HTD "S" series** (Cafeteria style with ***dry storage*** below) Same spec as HTD series only "S" series units to have (2) self-closing, sliding doors on one side below control panel. Doors mounted on overhead track assembly with stainless steel ball bearings. Doors to be stainless steel construction with plastic laminate exterior. Interior shelf to be 22 gauge stainless steel with integrally welded steel underbracing.

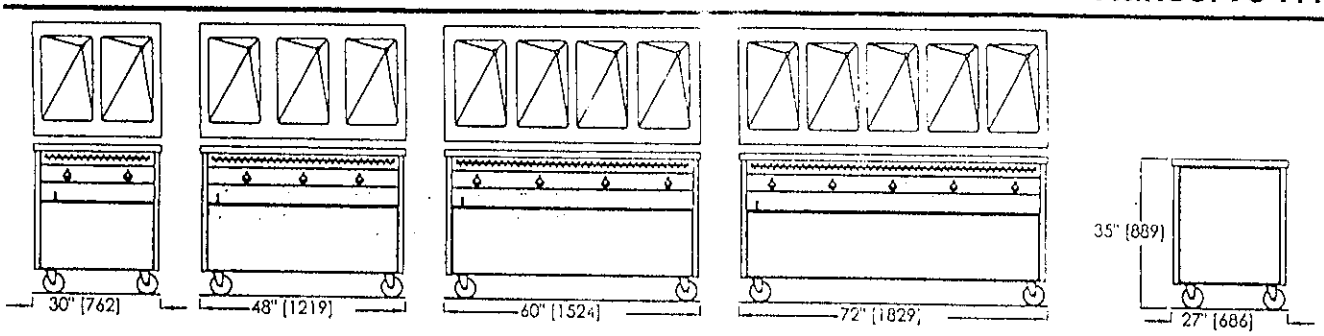
**HTD "B" series** (Cafeteria style with ***heated storage*** below) Same spec as HTD "S" series units only "B" series units to have a thermostatically controlled, electrically heated base with hinged doors and tray racks. Specify voltage. (NSF approved for food storage).

**Randell Manufacturing, Inc.**
520 S. Coldwater Rd. Weidman, MI 48893
Phone 1-800-621-8560 Fax 1-800-634-5369

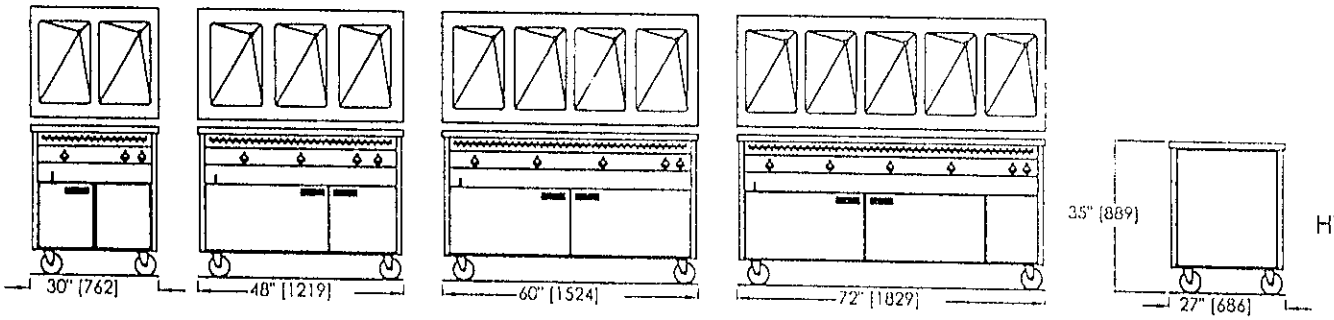
For the most current specifications, visit our WebSite. **www.randell.com**

# Dimensional Data

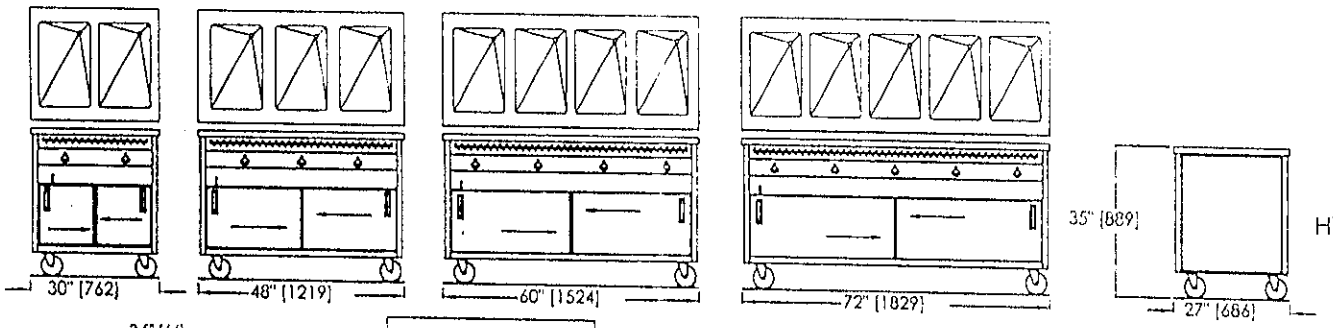




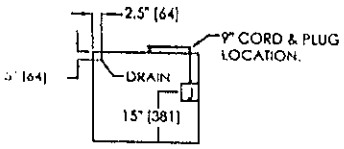

HTD Series




HTD "B" Series




HTD "S" Series




(TYPICAL ON ALL UNITS)

LEGEND FOR RAN HTD SERIES

AFF = ABOVE FIXED FLOOR

J-BOX = 6" AFF

3/4" DIA. COPPER DRAIN LINE EXTENDS TO 1" BELOW BOTTOM OF UNIT.

Our Product Line is On

AutoCAD™ R12-2000
AutoCAD™ Lt

| Enclosed Base Models | L | D | H | No. of Wells | No. of Elements | KW | 120V Amps* | NEMA | KW | 208V Amps* | NEMA | KW | 240V Amps* | NEMA | Ship Wt. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RAN HTD-2 | 30" | 27" | 35" | 2 | 2 | 2.2 | 18.4 | 5-30P | 2.2 | 10.6 | 6-15P | 2.2 | 9.2 | 6-15P | 175 |
| RAN HTD-3 | 48" | 27" | 35" | 3 | 3 | 3.3 | 27.6 | 5-50P | 3.3 | 15.9 | 6-20P | 3.3 | 13.8 | 6-20P | 215 |
| RAN HTD-4 | 60" | 27" | 35" | 4 | 4 | 4.4 | 36.8 | 5-50P | 4.4 | 21.2 | 6-30P | 4.4 | 18.4 | 6-30P | 260 |
| RAN HTD-5 | 72" | 27" | 35" | 5 | 5 | 5.5 | 46 | N/A | 5.5 | 27.5 | 6-50P | 5.5 | 23.0 | 6-30P | 325 |
| Dry Storage Base | | | | | | | | | | | | | | | |
| RAN HTD-2S | 30" | 27" | 35" | 2 | 2 | 2.2 | 18.4 | 5-30P | 2.2 | 10.6 | 6-15P | 2.2 | 9.2 | 6-15P | 175 |
| RAN HTD-3S | 48" | 27" | 35" | 3 | 3 | 3.3 | 27.6 | 5-50P | 3.3 | 15.9 | 6-20P | 3.3 | 13.8 | 6-20P | 215 |
| RAN HTD-4S | 60" | 27" | 35" | 4 | 4 | 4.4 | 36.8 | 5-50P | 4.4 | 21.2 | 6-30P | 4.4 | 18.4 | 6-30P | 260 |
| RAN HTD-5S | 72" | 27" | 35" | 5 | 5 | 5.5 | 46 | N/A | 5.5 | 27.5 | 6-50P | 5.5 | 23.0 | 6-30P | 325 |
| Heated Storage Base | | | | | | | | | | | | | | | |
| RAN HTD-2B | 30" | 27" | 35" | 2 | 2 | 3.3 | 27.6 | 5-50P | 3.03 | 14.6 | 6-20P | 3.3 | 13.8 | 6-15P | 175 |
| RAN HTD-3B | 48" | 27" | 35" | 3 | 3 | 4.4 | 36.8 | 5-50P | 4.125 | 19.8 | 6-30P | 4.4 | 18.4 | 6-30P | 215 |
| RAN HTD-4B | 60" | 27" | 35" | 4 | 4 | 5.5 | 46 | N/A | 5.225 | 25.1 | 6-50P | 5.5 | 23 | 6-30P | 260 |
| RAN HTD-5B | 72" | 27" | 35" | 5 | 5 | N/A | N/A | N/A | 6.325 | 30.4 | 6-50P | 6.6 | 27.5 | 6-50P | 325 |

* Note: Amperage for base unit only. Any accessory heat lamp or display illumination loads must be added to the total amperage.

## Randell Manufacturing, Inc.

Due to a continuous program of product improvement, Randell reserves the right to make changes in design and specifications without prior notice.

Star Manufacturing International, Inc.

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## Star Grill-Max™ Roller Grill

Model 20 and 20S
Model 30 and 30S
Model 45A and 45SA
Model 50 and 50S
Model 75A and 75SA

#C19

# Star Has a New Angle To Roller Grill Profits...

### *Breakfast sausages, hot dogs, and more are prepared best on a Star Grill-Max roller Grill!*

Star is pleased to offer the Star Grill-Max™ line of roller grills taking presentation and performance to its fullest potential morning, noon, and night.

**Features/Benefits:**

- ★ Unique stadium seating slanted roller design providing the best presentation of your products increasing sales and impulse purchases.
- ★ Slim-line design provides more grill surface in the same space. Increased capacity means additional sales and greater profits.
- ★ Latest technology in cooking and holding. Infinite temperature controls provide more linear heat control for better performance.
- ★ Easy access control knobs provide sectional heating for front and rear rollers.
- ★ Exclusive Duratec coated non-stick rollers, the best non-stick high performance coating for today's high volume operations. Duratec rollers meet the demands for improved durability, cleanability and feature superior grip for improved rollability of today's new Roller Grill snack foods.
- ★ The standard chrome rollers provide a durable cooking surface designed for traditional cooking operations.
- ★ Seal-Max, Star's exclusive superior heavy-duty roller bearing and seal combination provides smoother operation, longer life, low maintenance and grease-free internal compartments.

**Applications:**

Not only do Star Roller Grills, Bun Warmers and Sneeze guards combine to make the leading "Hot Dog Center" in the industry, but these versatile units can be used for breakfast sausages as well. These units, available in a variety of styles and sizes, are perfect for use in snack bars, convenience stores, recreational facilities, stadiums and virtually any venue where fast food is sold.

**Construction:**

Constructed of all stainless steel utilizing Duratec non-stick coated rollers or chrome rollers with tubular incoloy sheath elements. Infinite temperature controls for cooking and holding from low to high temperatures. Heavy-duty motor provides 360° rotation of rollers. Stadium seating of rollers provides a slope of 3° to 5° for better merchanding. Star incorporated its exclusive Seal-Max seal and bearing combination. Pilot light included and 120V units have a 6' cord and NEMA 5-20P, and 208/240V units NEMA 6-15P.

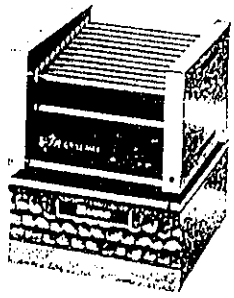
**Accessories:**

- ★ Optional merchandising door to increase merchandising opportunities and conceal the control panel.
- ★ High impact graphics are available to increase product awareness and build impulse sales.
- ★ Bun warmers and bun boxes. Bun warmers have thermostatic controls providing precise temperature control from 80° to 200°F.
- ★ Sneeze guards are formed polycarbonate and meet health department requirements.

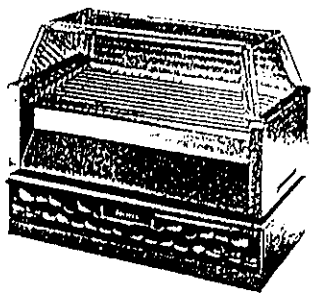
**Warranty:**

Star's Grill-Max and Grill-Max Pro are covered by a one year parts and labor warranty.

**Models 20 and SST20**



**Models 50S and SST50 with Sneeze Guard**



(Shown with optional merchandising door and graphics)

c UL us LISTED

STAR®

International Inc.

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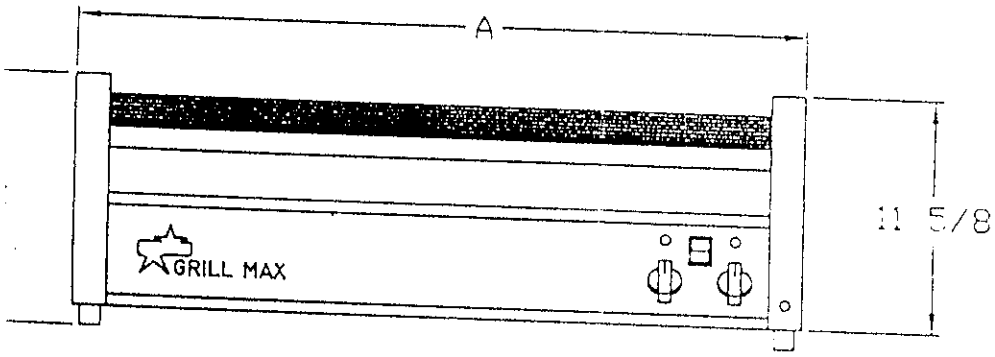
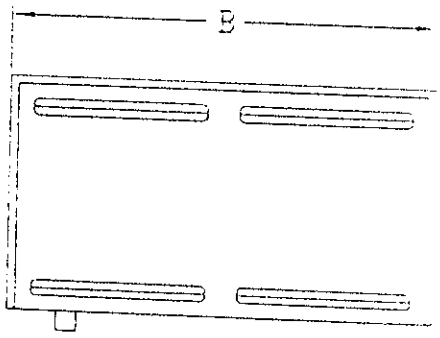
# Star Grill-Max™ Roller Grills

**Model 20 and 20S**
**Model 30 and 30S**
**Model 45A and 45SA**
**Model 50 and 50S**
**Model 75A and 75SA**

## *Star Has a New Angle To Roller Grill Profits...*




## Model Specifications

| Model No. | Capacity | Dimensions Width(A) Inches (cm) | Depth (B) Inches (cm) | Height (C) Inches (cm) | Voltage | Wattage | Amps | Approximate Shipping lbs. (kg) | Installed lbs. (kg) |
|---|---|---|---|---|---|---|---|---|---|
| 20 & 20S | 20 Hot Dogs | 17-1/8 (43.5) | 20-5/8 (52.4) | 12-1/2 (31.8) | 20V | 930 | 5 | 43 [illegible] | [illegible] |
| 30 & 30S | 30 Hot Dogs | 23-3/4 (60.3) | 20-5/8 (52.4) | 12-1/2 (31.8) | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| 45A & 45SA | 45 Hot Dogs | 23-3/4 (60.3) | 28-1/2 (72.4) | 12-1/2 (31.8) | 120V 230V | [illegible] | [illegible] | [illegible] | [illegible] |
| 50 & 50S | 50 Hot Dogs | 35-3/4 (90.8) | 20-5/8 (52.4) | 12-1/2 (31.8) | 120V 230V | 1535 | 13 [illegible] | [illegible] | [illegible] |
| 75A &75SA | 75 Hot Dogs | 35-3/4 (90.8) | 28-1/2 (72.4) | 12-1/2 (31.8) | 120V 208/240V 230V | [illegible] 1810/2400 2210 | [illegible] 10 9 | [illegible] | [illegible] |

## Merchandising Door Model Specifications

| Model | Roller Grill Models | |
|---|---|---|
| 20RGMD | Models 20 and 20S Merchandising Door | [illegible] |
| 30RGMD | Models 30,30S, 45A, 45SA Merchandising Door | [illegible] |
| 50RGMD | Models 45A, 45SA, 50, 50S Merchandising Door | [illegible] |

## Typical Specifications

[illegible]ller Grill is constructed of all stainless steel and utilizes Duratec non-stick coated rollers or chrome rollers and tubular incoloy sheath elements. Eleme[illegible] mounted in a fixed and floating system allowing for lateral expansion to minimize warping. Infinite temperature controls provide accurate cooking [illegible]lding from low to high. Unit has a heavy-duty motor and provides 360° rotation of rollers. The rollers are arranged in stadium seating with a slope [illegible] 5° providing better merchandising. The Roller Grill incorporates Sea-Max, Star's exclusive seal and bearing combination. The unit has a [illegible] [illegible]V units have a 6' lead in cord with NEMA 5-15P, UL Sanitation [illegible] NSF Std. #4 approved and UL listed. Star Grill-Max is patent [illegible]

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**Sneeze Guards Star Grill-Max and Old Style Roller Grills**

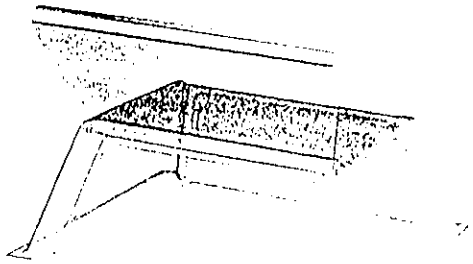
#C19

# Sneeze Guards

## Features/Benefits:

- ★ Ultra clear plastic provides clear and appetizing view of products.
- ★ Easy installation - fits tightly on sides of Roller Grills - no tools required.
- ★ Maintain cooking and warming temperatures more evenly.
- ★ One and two door styles available for use as operator only or self-serve applications.
- ★ Models are available to fit all new and old style roller grills with the exception of the model 40 and 12.
- ★ UL sanitation and safety approved - Meets Health Department requirements.
- ★ Heavy-duty polycarbonate material for years of maintenance free service.
- ★ Pass thru styles available.

**Model 30SG-1D**



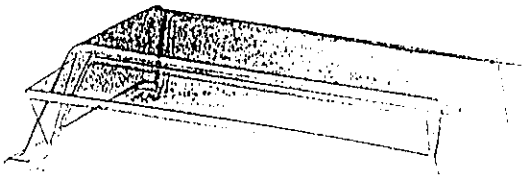
## Applicatons:

These sneeze guards are designed to fit our new style Star Grill-Max roller grills and the old style roller grill models. Complete your needs by adding a sneeze guard to protect your products.

## Construction:

Star's line of sneeze guards are constructed of 3/16" thick formed polycarbonate for easy maintenance free service.

**Model 45SG-FCA with optional SGS Sneeze Guard Shields**



## Warranty:

Sneeze Guards are covered by Star's one year parts and labor warranty.

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(314) 781-4344 (Int'l)

# Sneeze Guards Star Grill-Max and Old Style Roller Grills

## Sneeze Guards

### Model Specifications

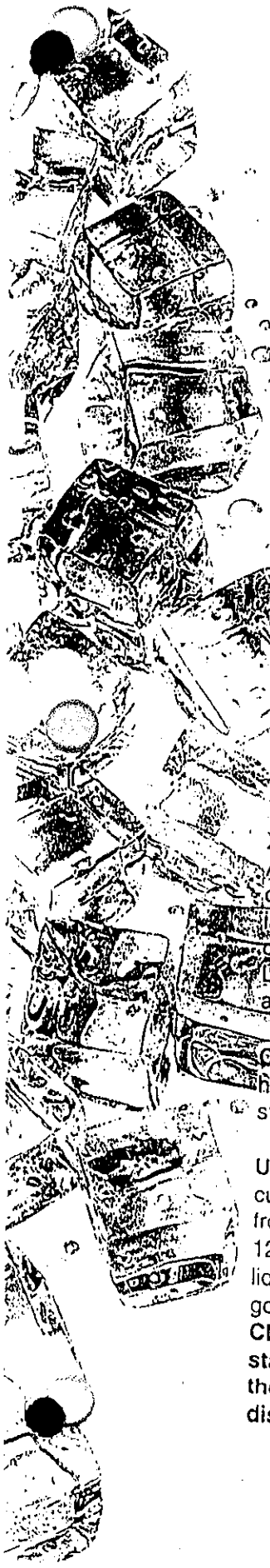
| Model No. | Description | Dimensions Width Inches (cm) | Dimensions Depth Inches (cm) | Dimensions Height Inches (cm) | Shipping Weight lbs. (kg) |
|---|---|---|---|---|---|
| | STAR GRILL-MAX SNEEZE GUARDS | | | | |
| 20SG-1D | Single Door Sneeze Guard- Models 20 & 20S | 17-1/2" (44.5) | 21-3/8" (54.3) | 9" (22.9) | [illegible] |
| 20SG-2D | Two Door Sneeze Guard- Models 20 & 20S | | | | |
| 30SG-1D | Single Door Sneeze Guard- Models 30, 30S, 30BB, 30SBB | 24-1/2" (62.2) | 21-3/8" (54.3) | 9" (22.9) | [illegible] |
| 30SG-2D | Two Door Sneeze Guard- Models 30, 30S, 30BB, 30SBB | | | | |
| 45SG-1D | Single Door Sneeze Guard- Models 45A, 45SA, 45ABB, 45SABB | 24-1/2" (62.2) | 29-1/4" (74.3) | 9" (22.9) | [illegible] |
| 45SG-2D | Two Door Sneeze Guard- Models 45A, 45SA, 45ABB, 45SABB | | | | |
| 50SG-1D | Single Door Sneeze Guard- Models 50, 50S, 50BB, 50SBB | 36-1/2" (92.7) | 21-3/8" (54.3) | 9" (22.9) | 20 [illegible] |
| 50SG-2D | Two Door Sneeze Guard- Models 50, 50S, 50BB, 50SBB | | | | |
| 75SG-1D | Single Door Sneeze Guard- Models 75A, 75SA, 75ABB, 75SABB | 36-1/2" (92.7) | 29-1/4" (74.3) | 9" (22.9) | 27 [illegible] |
| 75SG-2D | Two Door Sneeze Guard- Models 75A, 75SA, 75ABB, 75SABB | | | | |
| | OLD STYLE SNEEZE GUARDS | | | | |
| 25SG-FCA | Two Door Sneeze Guard for Models 25 and 25S | 23-5/8" (60.0) | 18" (45.7) | 9" (22.9) | 15 [illegible] |
| 45SG-FCA | Two Door Sneeze Guard for Models 45 and 45S | 35-3/8" (90.5) | 18" (45.7) | 9" (22.9) | 2[illegible] [illegible] |
| 75SG-FCA | Two Door Sneeze Guard for Models 75A and 75SA | 35-3/8" (90.5) | 27-1/2" (69.9) | 9" (22.9) | 2[illegible] [illegible] |
| 40SGA-PT | Pass-thru Sneeze Guard for Models 40 and 40S | | | | |
| | SNEEZE GUARD SHIELDS | | | | |
| 20SGS | Sneeze Guard Shield to replace one door for Model 20 Sneeze Guards | | | | |
| 30SGS | Sneeze Guard Shield to replace one door for Model 30 & 45 Sneeze Guards | | | | |
| 50SGS | Sneeze Guard Shield to replace one door for Models 50 & 75 Sneeze Guards | | | | |

Note: Sneeze Guard Shields can be added to two door models to create a pass through model. Dimensions will increase slightly in the depth of the unit.

### Typical Specifications

Sneeze Guard is constructed with 3/16" formed polycarbonate. Units are UL - Sanitation Classified to NSF Std. #4 approved. Prices in the U.S.A.

# SERVEND
## Ice & Beverage Systems



SerVend cup dispenser cabinets are manufactured in durable stainless steel and have cup tubes which are adjustable to accommodate various size cup diameters. (Cup diameter spec list on back of this sheet.)

Removable plastic tops allow ease of cleaning.

**Cup Dispenser Features**
You can tell the features of the cup dispenser by the letters and numbers used for cup dispenser model numbers. Cup dispenser model numbers are:

| | | |
|---|---|---|
| CD2A-C | CD3A-C | CD4X-C |
| CD2X-C | CD4A-C | CD4U |

CD is Cup Dispenser.
2, 3 or 4 refers to the number of cup storage tubes in the cup dispenser.

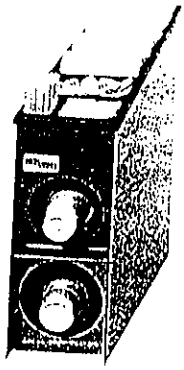
**A (Gravity fed cup storage tube)** – The cup storage tube is positioned at approximately a 45 degree angle and cups slide forward by gravity. Gravity fed cup tubes can be filled from the rear or front of the cup dispenser.

**X (Spring loaded cup storage tube)** – A heavy spring kit in the back of the cup tube keeps cups pushed forward in the cup storage tube. Spring loaded cup tubes are filled from the front. Light spring kits for styrofoam cups are available as a factory option.

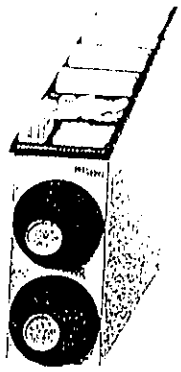
**C ("C" top)** – Cup dispenser top for high volume lid, straw and napkin storage. Removable plastic top.

**U (Universal cup tube)** – Each CD4U cup storage tube can hold any cup size from 3 5/8" - 4 5/8" in diameter (approx. 12-44 oz. cups). The CD4U has unique lid and straw storage compartments good for high volume applications. The **CD4U cup dispensers are not free standing, they must be mounted to the side of MD Series ice/beverage dispensers via the drain pan pin.**

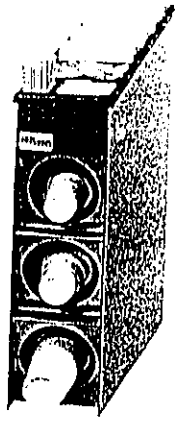
## Cup Dispenser Series



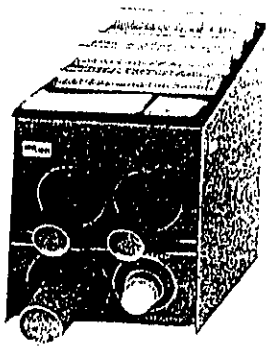
CD2A-C



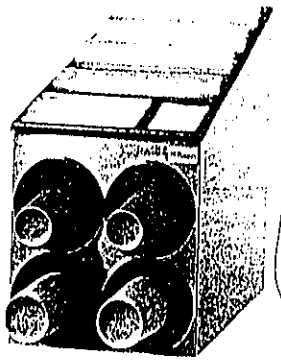
CD2X-C



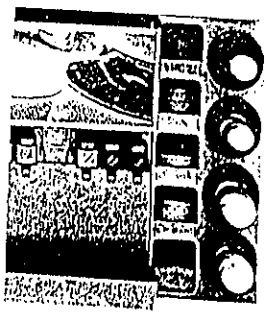
CD3A-C



CD4A-C



CD4X-C



CD4U

SERVEND™

# Cup Dispensers

| Model | Description | Ship Wt. |
|---|---|---|
| | Note: Cup diameters must be specified - measure diameter of top of cups. | |
| CD2A-C | Storage areas for lids, sugar, cream stirs and:<br>One 3 1/4" - 3 5/8" cup diameter, gravity cup tube (approx. 12-24 oz. cup).<br>One 4" - 4 3/4" cup diameter, gravity cup tube (approx. 20-46 oz. cup).<br>6" W x 24" D x 21" H / 15.2 W x 61 D x 53.3 H (cm) | 2[illegible] lbs. / 9.5 kgs. |
| CD2X-C | One 2 3/4" - 3 5/8" cup diameter, heavy spring loaded cup tube (approx. 12-24 oz. cup).<br>One 3 1/4" - 3 5/8" cup diameter, heavy spring loaded cup tube (approx. 20-46 oz. cup).<br>6" W x 23" D x 22 1/2" H / 5.2 W x 58.4 D x 57.2 H (cm) | [illegible] lbs. / 10 kgs. |
| CD3A-C | Two 3 1/4" - 3 5/8" cup diameter, gravity cup tubes (approx. 12-24 oz. cup).<br>One 4" - 4 3/4" cup diameter, gravity cup tube (approx. 20-46 oz. cup).<br>6" W x 24" D x 26 1/2" H / 15.2 W x 61 D x 67.3 H (cm) | 2[illegible] lbs. / 12 kgs. |
| CD4A-C | High volume lid, straw, napkin storage and:<br>Two 3 1/4" - 3 5/8" cup diameter, gravity cup tubes (approx. 12-24 oz. cup).<br>Two 4" - 4 3/4" cup diameter, gravity cup tubes (approx. 20-46 oz. cup).<br>14" W x 24" D x 22 1/2" H / 35.6 W x 61 D x 57.2 H (cm) | 33 lbs. / 15 kgs. |
| CD4X-C | Two 3 1/4" - 3 5/8" cup diameter, heavy spring loaded cup tubes (approx. 12-24 oz. cup).<br>Two 4" - 4 3/4" cup diameter, heavy spring loaded cup tubes (approx. 20-46 oz. cup).<br>14" W x 23" D x 25 1/8" H / 35.6 W x 58.4 D x 63.8 H (cm) | 39 lbs. / 18 kgs. |
| CD4U | High volume lid and straw storage. Four cup tubes (approx. 12-44 oz. cups 3 3/8" - 4 5/8" cup diameter).<br>Maximum 3 7/8" diameter for styrofoam cup.<br>No special cup tube sizes available.<br>12 3/4" W x 22 1/2" D x 32" H / 32.4 W x 57.1 D x 81.3 H (cm) | 38 lbs. / 17 kgs. |

**Special: An additional list price of $195 applies to any order placed with a non-standard cup tube set. Non-standard, "special" cup dispensers are NOT subject to cancellation.**

**Options (Gravity Feed Only):**

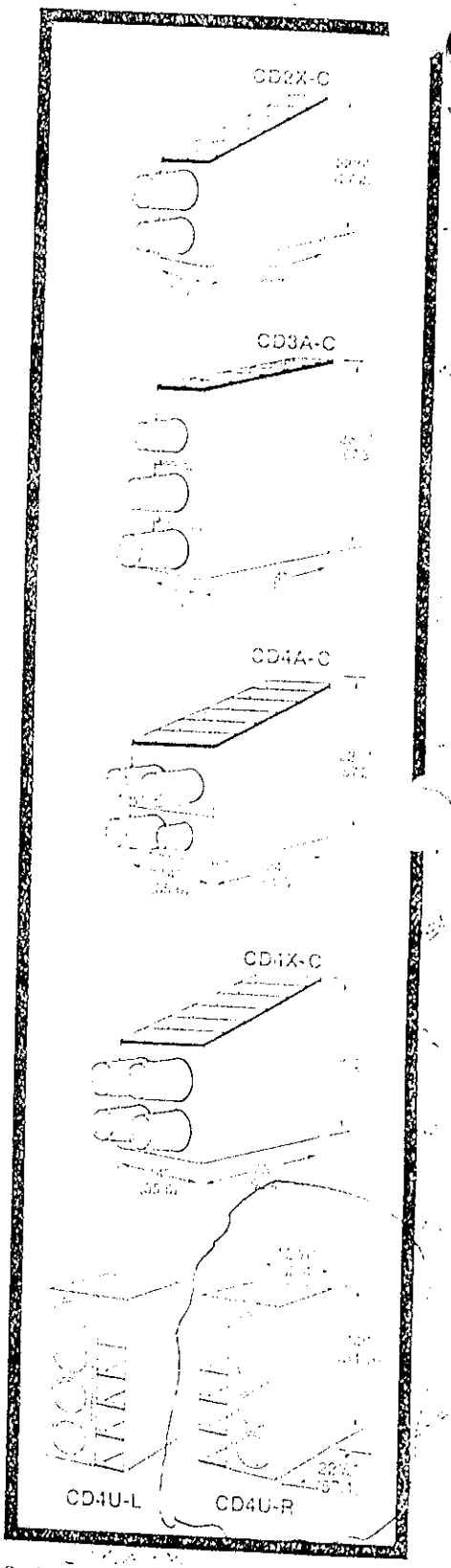
| | | |
|---|---|---|
| 01-012-01LT | Light spring kit for gravity cup tubes (per tube).<br>For styrofoam cups | 2 lbs. / 1 kg. |
| 01-012-01HY | Heavy spring kit for gravity cup tubes (per tube).<br>For paper cups and plastic cups | 2 lbs. / 1 kg. |

**Cup Tube Sizing Guide:**

To determine which cup dispenser tubes fit your cup sizes, measure the diameter of the top of your cups. Because of various cup heights, cup ounce size is not an accurate sizing guide for cup dispenser tubes.

**SerVend Warranty**

Two years limited parts warranty. One year limited labor warranty. Optional third year extended customer care warranty. Call local distributor for details.





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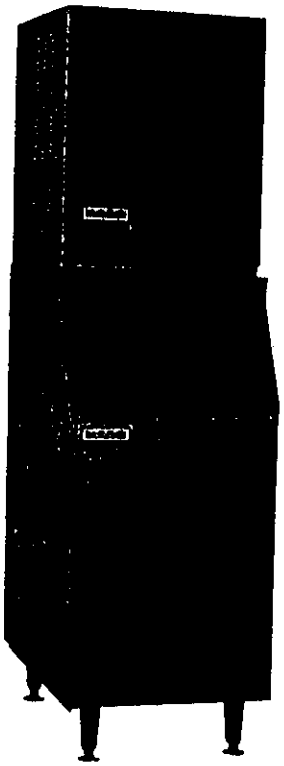
C24

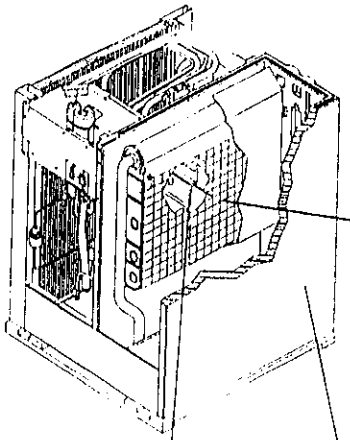


ECP 500 shown on model B-42 Bin

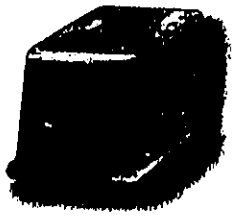
## ECP 500

**Produces up to 553 lbs. (251 Kgs.)* of ice per day.**

- Slim 22" (559mm) wide plastic cabinet is corrosion-proof.
- Most advanced "Harvest Assist" system gets ice to the bin quicker. It conserves energy and increases compressor life.
- Easy to service and install. The ECP Series machines have electro-mechanical controls.
- Works on all standard industry dispensers and bins.
- Environmentally responsible. All ECP Series machines use R-404A, an approved, non-ozone depleting refrigerant.
- Proven "classic cube" shape. Half cube and Full cube systems available.
- Available with an air- or water-cooled condenser.



Half Cube
7/8" x 7/8" x 3/8"
(22mm x 22mm x 10mm)



Full Cube
7/8" x 7/8" x 7/8"
(22mm x 22mm x 22mm)

Not shown actual size

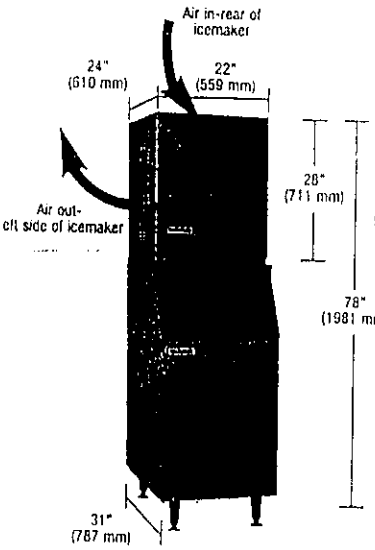
IOM **Ice-O-Matic**®

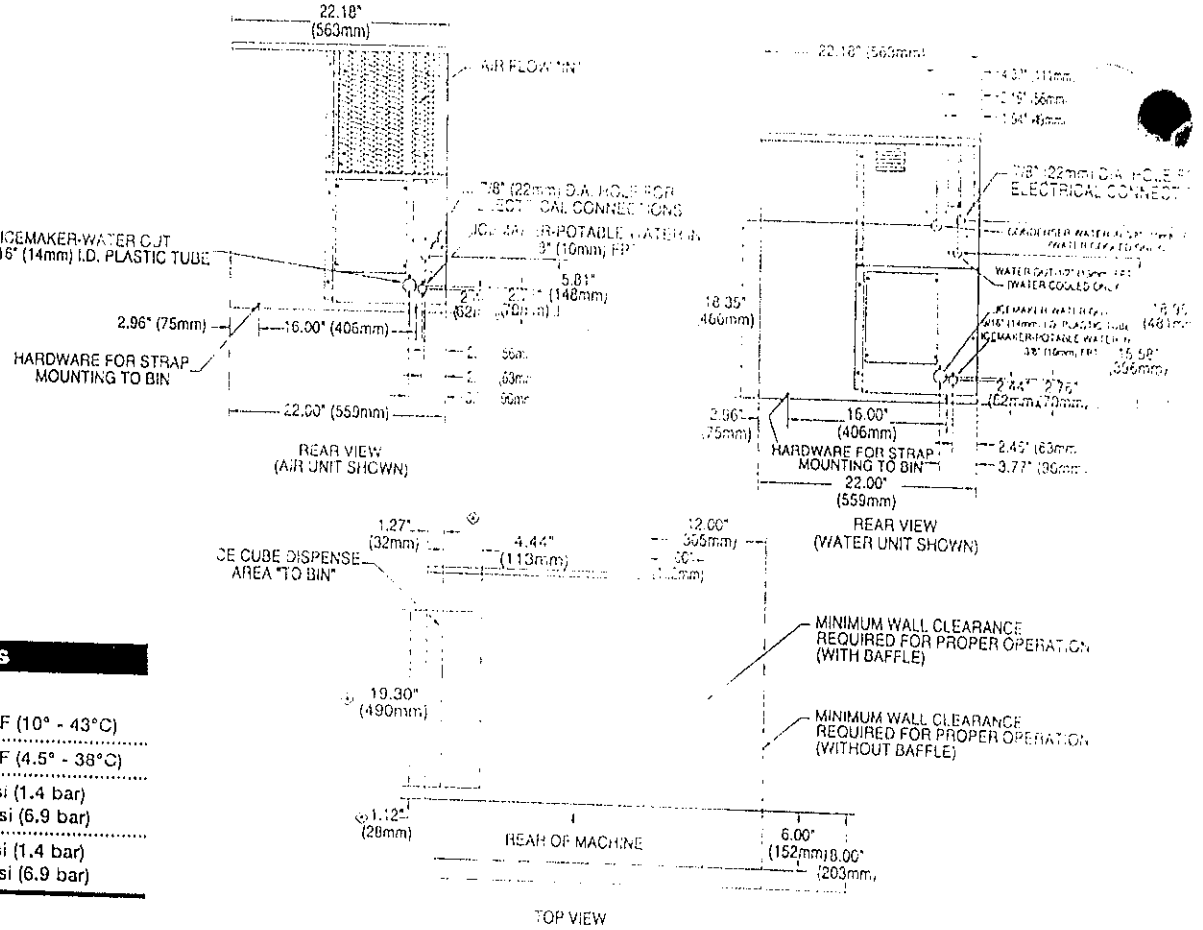
A WELBILT Company

*Tested at 70° Air/50° Water

# ECP 500 Series Cube Ice Maker

**Dimensions and Air Flow**




## OPERATING LIMITS

| | |
|---|---|
| Ambient Temp. Range Air & Water | 50° - 110°F (10° - 43°C) |
| Water Temp. Range | 40° - 100°F (4.5° - 38°C) |
| Water Pressure Ice Maker Water In | Min. 20 psi (1.4 bar)<br>Max. 60 psi (6.9 bar) |
| Condenser Inlet Water (Water cooled only) | Min. 20 psi (1.4 bar)<br>Max. 60 psi (6.9 bar) |

## ICE PRODUCTION CHART POUNDS (KILOGRAMS) PER 24 HOURS

| Conds. Unit | Air Temp. °F (°C) | ECP500 Water Temp. °F (°C) 80°(27°) | 70°(21°) | 50°(10°) | ECP556 Air Temp. °F (°C) | Water Temp. °F (°C) 80°(27°) | 70°(21°) | 50°(10°) | ECP555 Air Temp. °F (°C) | Water Temp. °F (°C) 80°(27°) | 70°(21°) | 50°(10°) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air Cooled | 90° (32°) | 368 (167) | **396 (180)** | 459 (208) | 90° (32°) | 385 (175) | **414 (188)** | 478 (217) | 90° (32°) | 335 (152) | 360 (164) | 429 (195) |
| | 80° (27°) | 428 (194) | 460 (209) | 506 (230) | 80° (27°) | 445 (202) | 478 (217) | 526 (239) | 80° (27°) | 406 (185) | 437 (198) | 480 (218) |
| | 70° (21°) | 467 (212) | 503 (228) | **553 (251)** | 70° (21°) | 485 (221) | 522 (237) | **574 (261)** | 70° (21°) | 450 (204) | 484 (220) | 532 (242) |
| Water Cooled | 90° (32°) | 391 (178) | **420 (191)** | 458 (208) | 90° (32°) | 470 (213) | **505 (230)** | 535 (243) | | | | |
| | 80° (27°) | 411 (187) | 442 (201) | 486 (221) | 80° (27°) | 471 (214) | 507 (230) | 558 (253) | | | | |
| | 70° (21°) | 435 (198) | 467 (212) | **514 (234)** | 70° (21°) | 490 (223) | 527 (240) | 580 (264) | | | | |

1. 90°/70° figures are rated in accordance with ARI Standard 810. All remaining points are mathematical estimates.
2. All specifications and performance data are subject to normal manufacturing variances.

## ORDERING AND SPECIFICATION INFORMATION

| Model No. | Cond. Unit | Ice Production per 24 hrs. at 70° Air/50° Water lbs. (Kgs.) | Ice Production per 24 hrs. at 90° Air/70° Water lbs. (Kgs.) | Water Used-Gals. (Lits.) per 100 lbs. of Ice 90° Air/70° Water: Ice Prod. Use | Cond. Use | Kilowatts Used per 100 lbs. of Ice 90° Air 70° Water | Btuh | Voltage Characteristics | No. of Wires | Min. Circuit Amp. | Max. Fuse Size | Shipping Weight lbs. (Kgs.) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ECP500✣A | Air | 553 (251) | 396 (180) | 29.7 (112) | n/a | 8.5 | 10199 | 115/60/1 | 3 | 18.9 | 20 | 165 (75) |
| ECP500✣W | Water | 514 (234) | 420 (191) | 27.3 (103) | 117.4 (444) | 7.2 | 9769 | 115/60/1 | 3 | 14.8 | 15 | 165 (75) |
| ECP556✣A | Air | 574 (261) | 414 (188) | 26.3 (100) | n/a | 6.8 | 9353 | 208-230/60/1 | 3 | 10.8 | 15 | 165 (75) |
| ECP556✣W | Water | 580 (264) | 505 (230) | 31.8 (120) | 144.3 (546) | 5.0 | 9669 | 208-230/60/1 | 3 | 7.3 | 15 | 165 (75) |
| ECP555✣A | Air | 532 (242) | 360 (164) | 31.4 (119) | n/a | 9.3 | 9808 | 230/50/1 | 3 | 14.0 | 15 | 165 (75) |

See Bin specification sheet for information on ice storage bins

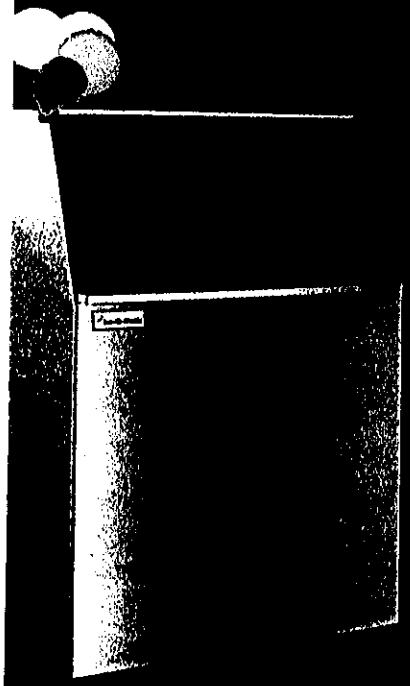
✣ represents cube size. For full cube substitute an "F", for half cube substitute an "H".
Please note: air-cooled units require 6" (152 mm) clearance for air intake and exhaust.


Ice-O-Matic/Mile High 11100 E. 45th Avenue, Denver, CO 80239
Tel. 303 371-3737 Fax. 303 371-6296 www.iceomatic.com



We reserve the right to make changes in design and specifications at any time without obligation.

# B Series storage bins



**B55**
**Storage Bin**

50 years of quality and innovation

## Storage capacity from 255 lbs. (116 Kgs.) to 1866 lbs. (846 Kgs.).

- Dependable storage for either cube ice or flake ice.
- Use with ICE, GC or EMF Series ice makers.

B25 to B100

- Insulated on all sides and bottom with foamed-in-place polyurethane. Non-corrosive bin liner and molded plastic door.
- Stainless steel exterior (except B25 which has polyethylene molded exterior and interior).
- 6" to 7" (152 to 178mm) adjustable NSF approved legs.
- Bin drains are located at the rear of cabinet.

B120 to B170

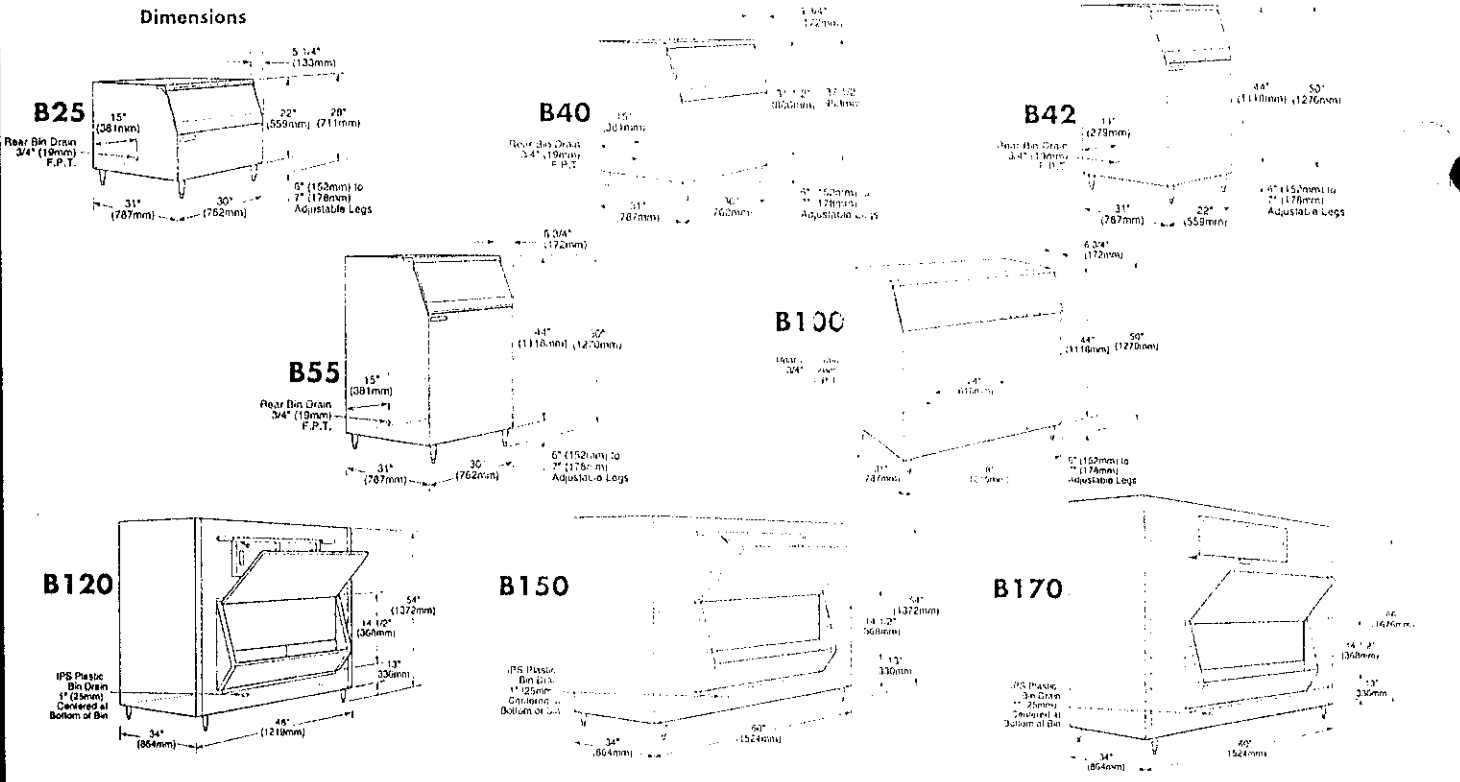
- "SP" models have all stainless steel front and side panels, and galvanized back and bottom.
- "SS" models are all stainless steel: front, back, bottom, top and sides. All stainless steel is 300 series.
- All welded stainless steel door frame with all stainless steel, fully insulated, and gasketed door, providing a completely sanitary seal. Hold-open clips provided for convenience when using door.
- Roto-molded snout is dent and scratch resistant. The snout clips to bin front for convenience and safety. It can be easily removed for shoveling ice and cleaning.
- Sliding plastic view window provides access for ice breakup.
- Bin liner is polyethylene. Foamed-in-place insulation is 2" (51mm) thick on bottom and 1-1/2" (38mm) on walls, providing maximum ice preservation.
- 6" (152mm) adjustable black metal legs standard.

Ice-O-Matic®

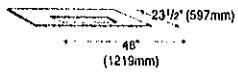
B Series Storage Bins

# B Series Storage Bins

## Dimensions

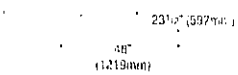



## Bin Tops

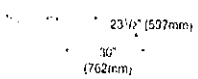



**KBT5**
Bin Top for 48" (1219mm) bins with 30" (762mm) ICE Series cube ice makers

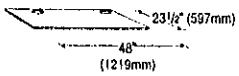
**KBT6**
Bin Top for 48" (1219mm) bins with 30" (762mm) GC cube ice makers



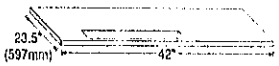

**KBT7**
Bin Top for 48" (1219mm) bins with 16" (406mm) EMF flake ice makers



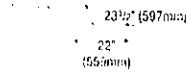

**KBT8**
Bin Top for 30" (762mm) bins with 16" (406mm) EMF flake ice makers



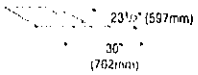

**KBT9**
Bin Top for 48" (1219mm) bins with (2) 16" (406mm) EMF flake ice makers



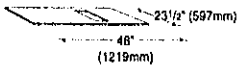

**KBT10**
Bin Top for 42" (1067mm) bins with 30" (762mm) ICE Series cube ice makers



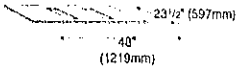

**KBT14**
Bin Top for the 22" (559mm) bin with 16" (406mm) EMF flake ice makers



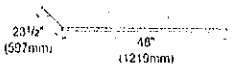

**KBT15**
Bin Top for 30" (762mm) bins with 22" (559mm) GC cube ice makers



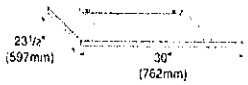

**KBT16**
Bin Top for 48" (1219mm) bins with 22" (559mm) GC cube ice makers




**KBT17**
Bin Top for 48" (1219mm) bins with (2) 22" (559mm) GC cube ice makers




**KBT18**
Bin Top for 48" (1219mm) bins with 30" (762mm) EMF flake ice makers




**KBT19**
Bin Top for 30" (762mm) bins with 22" (559mm) ICE Series cube ice makers

## ORDERING AND SPECIFICATION INFORMATION

| Bin Model No. | Bin Storage Lbs (Kgs) | Required Bin Top: Ice Series™ Cube Ice Makers 22" wide | 30" wide | 48" wide | GC Cube Ice Makers 22" wide | 30" wide | Flake Ice Makers 16" wide | 30" wide | 48" wide | Weight Lbs. (Kgs.) |
|---|---|---|---|---|---|---|---|---|---|---|
| B25PP | 255 (116) | KBT19 | Not Required | N/A | KBT15 | Not Required | KBT8 | Not Required | N/A | 95 (43) |
| B40PS | 365 (166) | KBT19 | Not Required | N/A | KBT15 | Not Required | KBT8 | Not Required | N/A | 135 (61) |
| B42PS | 374 (170) | Not Required | N/A | N/A | Not Required | N/A | KBT14 | N/A | N/A | 135 (61) |
| B55PS | 556 (252) | KBT19 | Not Required | N/A | KBT15 | Not Required | KBT8 | Not Required | N/A | 175 (79) |
| B100PS | 927 (420) | Not Available | KBT5 | Not Required | KBT16, KBT17* | KBT6 | KBT7, KBT9* | KBT18 | Not Required | 230 (104) |
| B120SP✣/SS | 1193 (541) | Included | Included | Included | Included | Included | Included | Included | Included | 345 (156) |
| B150SP✣/SS | 1499 (680) | Included | Included | Included | Included | Included | Included | Included | Included | 355 (161) |
| B170SP✣/SS | 1866 (846) | Included | Included | Included | Included | Included | Included | Included | Included | 375 (170) |

✣ = Bin top is included - must specify icemaker application when ordering bin.

We reserve the right to make changes in design and construction at any time without obligation.
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Ice-O-Matic/Mile High 11100 E. 45th Avenue, Denver, CO 80239 Tel. 303 371-3737 Fax. 303 371-6296 www.iceomatic.com

Delfield

Project _____

Item Number #C30/33

Quantity _____ Date _____

Approval _____

# SRR-S/SFR-S

## Supremacy Series® Solid Door Reach-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units mounted on 6" (15.24cm) legs.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Doors on refrigerated units are constructed with double-pane tempered thermopane glass. Doors on freezer units are constructed with double-pane low E, Argon filled tempered thermopane glass. Door frames are constructed with a combination of extruded aluminum/PVC, and are provided with magnetic, gaskets. Doors will have self-closing hinges and continuous handle along vertical dimension of door(s). Glass door constructed to eliminate need for heater wires.

- Please specify right or left hand hinging at time of order.

Mechanical controls shall be located behind a removable shroud facing.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

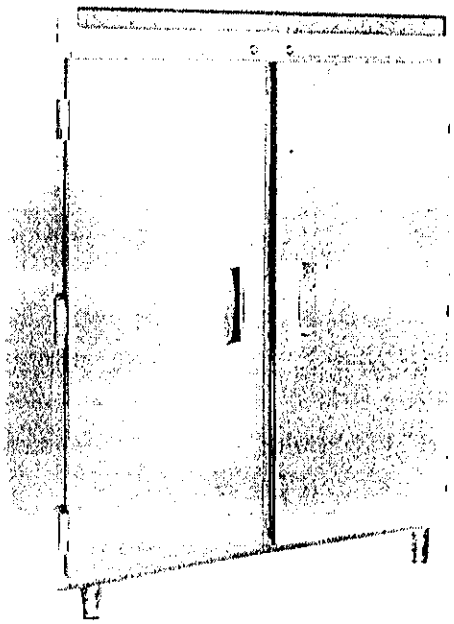
Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain −10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.



MODEL SRR2-S

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

Remote units are supplied with 6" stainless steel legs and J-box for field connection.

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 4" Casters

c UL NSF UL 404A

The Delfield Company, 980 S. Isabella Rd., Mt. Pleasant, MI 48858, U.S.A. • (800) 733-8821 • Fax (800) 669-0619 • www.delfield.com

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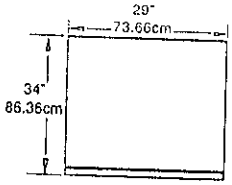
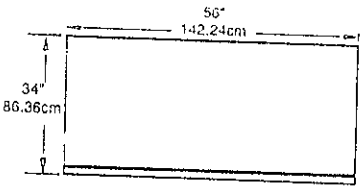
Delfield

# SRR-S/SFR-S

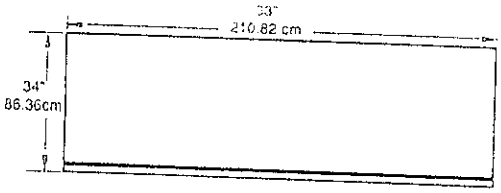
## Supremacy Series® Solid Door Reach-In Refrigerators and Freezers



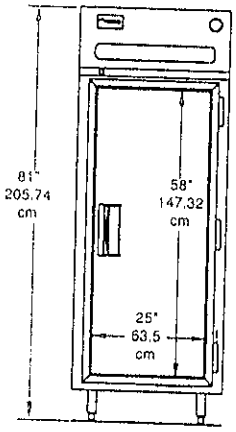

PLAN VIEW



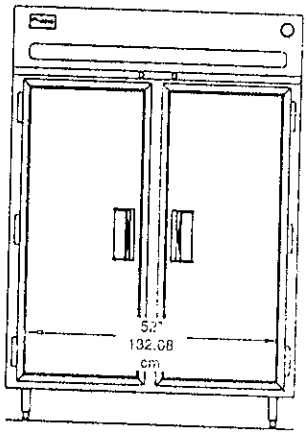

PLAN VIEW



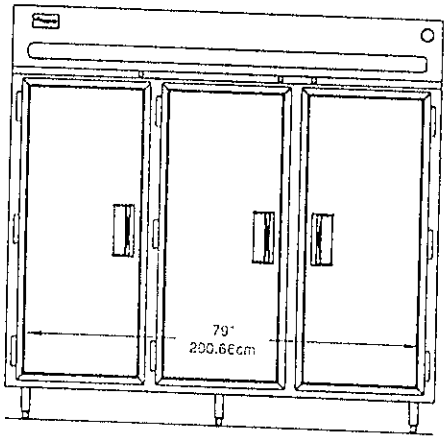

PLAN VIEW



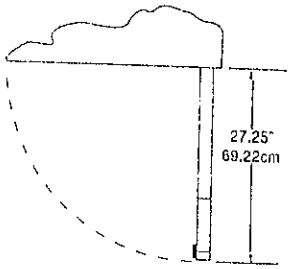

FRONT ELEVATION



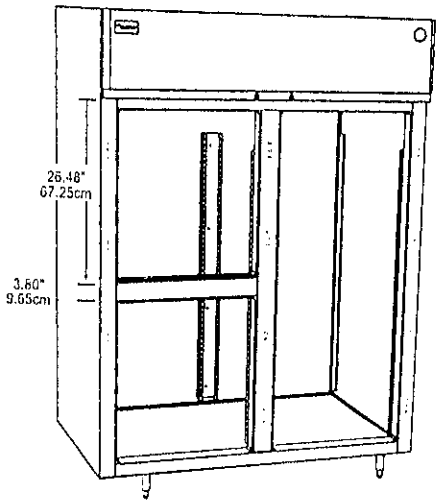

FRONT ELEVATION



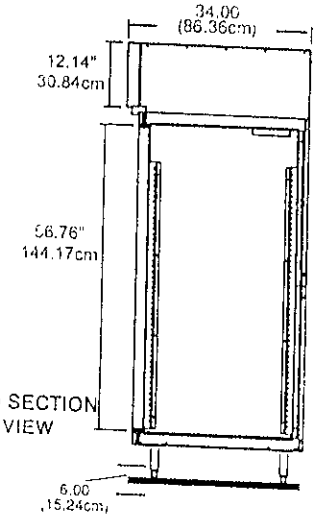

FRONT ELEVATION




DOOR CLEARANCE DETAIL




PERSPECTIVE VIEW




END SECTION VIEW

## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| REFRIGERATORS | | | | | | | | | | |
| SRR1-S | 115 | 8.5 | 24.96 | 12.81 | 3 | 1/4 | 758 | 2015 | 416 | 5-15P |
| SRR2-S | 115 | 12.8 | 51.92 | 27.54 | 6 | 1/3 | 1374 | 2522 | 650 | 5-20P |
| SRR3-S | 115 | 8.9 | 78.89 | 42.47 | 9 | 1/2 | 1971 | 3637 | 830 | 5-15P |
| FREEZER | | | | | | | | | | |
| SFR1-S | 115 | 11.4 | 24.96 | 12.81 | 3 | 1/2 | 1239 | 1868 | 440 | 5-15P |
| SFR2-S | 115 | 16 | 51.92 | 27.54 | 6 | 3/4 | 2247 | 3326 | 710 | 5-20P |
| SFR3-S | 115/208-230 | 11.4 | 78.89 | 42.47 | 9 | 1 | 3222 | 4136 | 960 | 14-20P |

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DSSR 02/03

Delfield

Project _____

Item Number #C31

Quantity _____ Date _____

Approval _____

# SRR-S/SFR-S

## Supremacy Series® Solid Door Reach-In Refrigerators and Freezers

**EXTERIOR / INTERIOR**

Cabinet exterior sides, front, and shroud shall be 22-gauge stainless steel. Facing of shroud shall be easily removable without the use of tools.

Cabinet interior shall be 22-gauge stainless steel. Bottom & top of liner shall be die-stamped to provide radius corners and a recessed bottom. Base shall be fully insulated with high-density foamed in place polyurethane.

Interior shall have 3 chrome-plated wire shelves per door section. Shelf support pilasters shall be heavy-duty stainless steel, with shelves adjustable at 1" (2.5 cm) increments. Units mounted on 6" (15.24cm) legs.

**DOORS**

Solid doors shall have a 22-gauge stainless steel exterior & interior liner, & shall be fully insulated with high density foamed in place polyurethane. Each door shall have 3 self-closing, cam-lift style hinges. Doors shall be easily removable without use of tools. Door gaskets shall be magnetic snap-in style to allow simple replacement. Door handles shall be recessed.

Doors on refrigerated units are constructed with double-pane tempered thermopane glass. Doors on freezer units are constructed with double-pane low E, Argon filled tempered thermopane glass. Door frames are constructed with a combination of extruded aluminum/PVC, and are provided with magnetic, gaskets. Doors will have self-closing hinges and continuous handle along vertical dimension of door(s). Glass door constructed to eliminate need for heater wires.

- Please specify right or left hand hinging at time of order.

Mechanical controls shall be located behind a removable shroud facing.

**THE FOLLOWING APPLIES TO REFRIGERATORS ONLY**

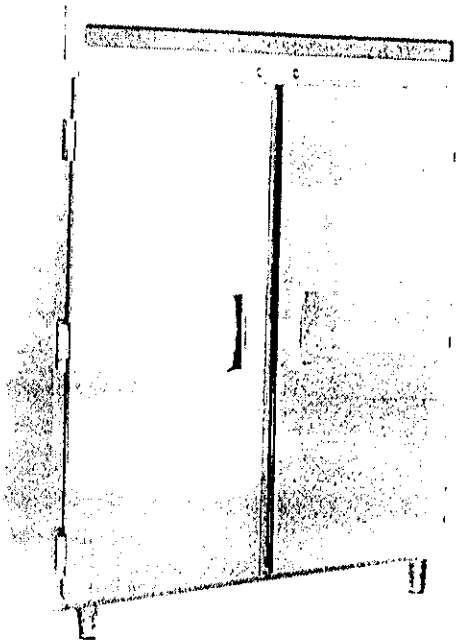
Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall be coated to prevent corrosion. Cabinet shall maintain 34°F to 40°F (1°C to 4°C) internal temperature.

**THE FOLLOWING APPLIES TO FREEZERS ONLY**

Refrigeration system shall use R404A refrigerant. System shall be completely outside food zone to maximize internal storage space. System shall utilize a dual diversion high flow air distribution system, and shall be a high capacity design with thermostatic expansion valves. Evaporator coils shall have deep-corrugated, staged fin construction for maximum efficiency with fewer defrost cycles. Cabinet shall maintain -10°F to 0°F (-23°C to -18°C) internal temperature.

**SINGLE VOLTAGE MODELS ONLY**

Electrical connections shall be 115 volt, 60 hertz, single phase, with an 8 ft (2.4m) long electrical cord & plug as shown on reference chart. Cord & plug shall be wired to the junction box on top of the unit.



MODEL SRR2-S

**DUAL VOLTAGE MODELS ONLY**

Electrical connections shall be 115/208-230 volt, 60 hertz, single phase, and must be hard-wired to the junction box located on top of the unit.

Remote units are supplied with 6" stainless steel legs and J-box for field connection.

**OPTIONS & ACCESSORIES**

- Stainless steel backs
- Laminate on doors & ends
- Additional shelves and bridges
- Tray slides
- Kick panels
- Half-size hinged glass or stainless steel doors, two doors per section
- Remote refrigeration
- Correctional Facilities package
- ERC-2 microprocessor - based controls
- 4" Casters

c UL NSF UL 404A

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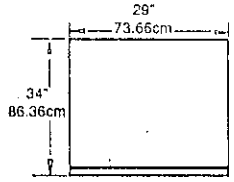
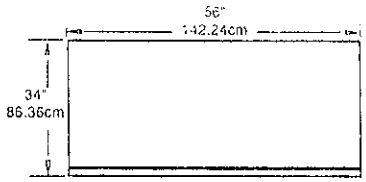
# SRR-S/SFR-S

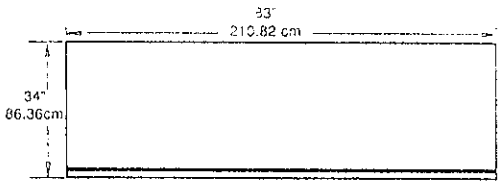
## Supremacy Series® Solid Door Reach-In Refrigerators and Freezers



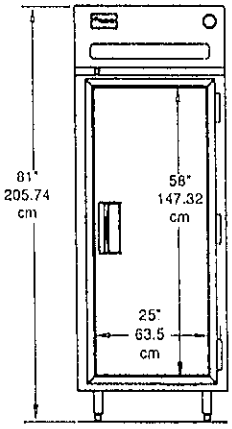

PLAN VIEW



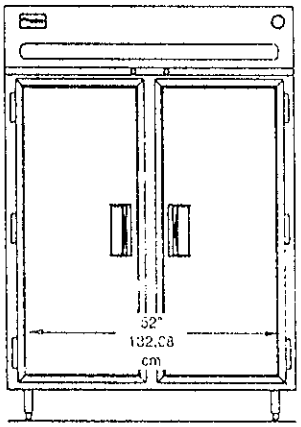

PLAN VIEW



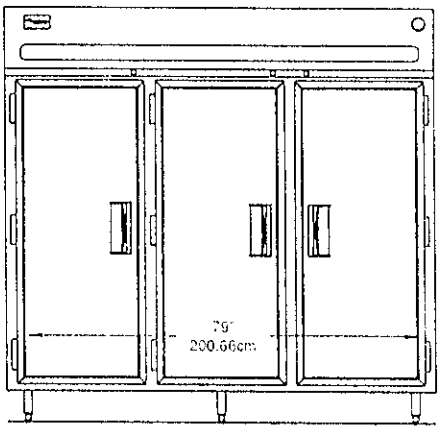

PLAN VIEW



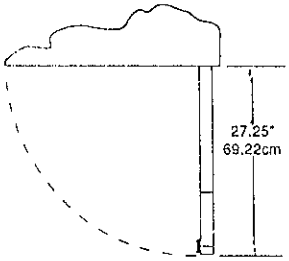

FRONT ELEVATION



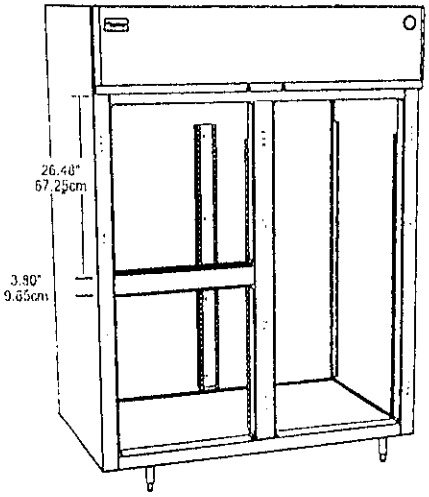

FRONT ELEVATION



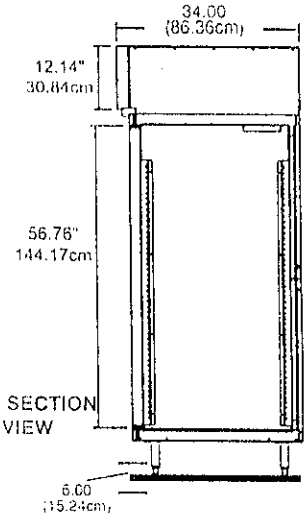

FRONT ELEVATION




DOOR CLEARANCE DETAIL




PERSPECTIVE VIEW




END SECTION VIEW

## MECHANICAL DATA

| MODEL | VOLTAGE | AMPS | STORAGE | SHELVES SQ. FT. | NO SHELVES | UNIT H.P. | BTU/HR CAB LOAD | BTUHR SYSTEM CAP | SHIP WEIGHT | NEMA PLUG |
|---|---|---|---|---|---|---|---|---|---|---|
| REFRIGERATORS | | | | | | | | | | |
| SRR1-S | 115 | 8.5 | 24.96 | 12.81 | 3 | 1/4 | 758 | 2015 | 418 | 5-15P |
| SRR2-S | 115 | 12.8 | 51.92 | 27.54 | 6 | 1/3 | 1374 | 2522 | 650 | 5-20P |
| SRR3-S | 115 | 8.9 | 78.89 | 42.47 | 9 | 1/2 | 1971 | 3637 | 839 | 5-15P |
| FREEZER | | | | | | | | | | |
| SFR1-S | 115 | 11.4 | 24.96 | 12.81 | 3 | 1/2 | 1239 | 1868 | 445 | 5-15P |
| SFR2-S | 115 | 16 | 51.92 | 27.54 | 6 | 3/4 | 2247 | 3326 | 710 | 5-20P |
| SFR3-S | 115/208-230 | 11.4 | 78.89 | 42.47 | 9 | 1 | 3222 | 4136 | 960 | 14-20P |

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ATTACHMENT 13

SUSTAINABLE DESIGN SpiRiT CHECKLIST

# Sustainable Project Rating Tool (SPiRiT)

**Version 1.4.1**

**U. S. Army Corps of Engineers**
**U. S. Army Assistant Chief of Staff for Installation Management**

June 2002

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# NOTES

1) This Sustainable Project Rating Tool (SPiRiT) is derived from The U. S. Green Building Council LEED 2.0 (Leadership in Energy and Environmental Design) Green Building Rating System ™.

2) The SPiRiT numbering scheme parallels, but does not match LEED 2.0. LEED does not number major sections, which it calls 'Credit Categories,' ex. 'Sustainable Sites,' rather it numbers criteria or 'credits' within each major section. SPiRiT credit numbers match those of LEED where there is a 1:1 comparison. Where additional credits have been added they fall at the end of major sections.

3) The SPiRiT Credits all follow the format: Intent, Requirement and Technologies/Strategies.

Intent: A statement of the primary goal for the credit;
Requirement: Quantifiable conditions necessary to achieve stated intent;
Technologies/Strategies: Suggested technologies, strategies and referenced guidance on the means to achieve identified requirements.

4) Projects are evaluated for each SPiRiT credit which are either 'Prerequisites' or result in a point score:

Prerequisites: These credits are a statement of minimum requirements and must be met. No further points will be awarded unless the minimum is achieved. These credits are recognizable by an 'R' in the number scheme, ex. 1.R1, and a 'Reqd.' in the score column.
Point Score: These credits are evaluated and result in a point score. Where the potential score is greater than 1, no partial points are granted.

5) SPiRiT Sustainable Project Certification Levels:

| | |
|---|---|
| SPiRiT Bronze | 25 to 34 Points |
| SPiRiT Silver | 35 to 49 Points |
| SPiRiT Gold | 50 to 74 Points |
| SPiRiT Platinum | 75 to 100 Points |

6) SPiRiT credits have been developed to address facility life cycle phases including programming, design, construction, and commissioning. Additional rating tools will be developed to address installation/base master planning and facilities operations and maintenance, rehabilitation, recycling, and disposal.

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Donald Fournier, U. S. Army Engineering Research & Development Center (ERDC-CERL)
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9) Army/USACE employees are members of the USGBC with membership privileges accessible via the USGBC web site, http://www.usgbc.org. For information on membership and access to available LEED resources to support use of SPiRiT and sustainable design in your projects, contact Richard Schneider at (217) 373-6752 or richard.l.schneider@erdc.usace.army.mil (Annette Stumpf at (217) 352-6511 ext. 7542 or annette.l.stumpf@erdc.usace.army.mil alternate).

10) For the latest information on SPiRiT and for access to guidance, tools and resources supporting sustainable design initiatives, visit the CERL 'Sustainable Design and Development Resource' website, http://www.cecer.army.mil/SustDesign. There you may also join the CERL Sustainable Design ListServ to be directly notified of information pertinent to sustainable design.

# 1.0 Sustainable Sites — Score 20

## 1.R1 Erosion, Sedimentation, and Water Quality Control [1] — Reqd.

Intent: Control erosion and pollutants to reduce negative impacts on water and air quality.

Requirement:

- ❑ Design a site sediment and erosion control plan and a pollution prevention plan that conforms to best management practices in the EPA's Storm Water Management for Construction Activities, EPA Document No. EPA-833-R-92-001, Chapter 3, OR local Erosion and Sedimentation Control standards and codes, whichever is more stringent. The plan shall meet the following objectives:
  - Prevent loss of soil during construction by storm water runoff and/or wind erosion, including protecting topsoil by stockpiling for reuse.
  - Prevent sedimentation of storm sewer or receiving streams and/or air pollution with dust and particulate matter.
  - Prevent hazardous material discharge into storm water systems.
  - Prevent petroleum oils and lubricants (POL) discharge into storm water systems.

Technologies /Strategies: The EPA standard lists numerous measures such as silt fencing, sediment traps, oil grit separators, construction phasing, stabilization of steep slopes, maintaining vegetated ground cover and providing ground cover that will meet this prerequisite.

## 1.C1 Site Selection [1]

Intent: Avoid development of inappropriate sites and reduce the environmental impact from the location of a building on a site. Select site based on functional adjacencies/relationships and land use compatibility.

Requirement:

- ❑ Do not develop buildings on portions of sites that meet any one of the following criteria: 1
  - Prime training or maneuver land.
  - Land whose elevation is lower than 5 ft. above the 100-year flood elevation as defined by FEMA.
  - Land that provides habitat for any species on the Federal or State threatened or endangered list.
  - Within 100 feet of any wetland as defined by 40 CFR, Parts 230-233 and Part 22, OR as defined by local or state rule or law, whichever is more stringent.
- ❑ Select site based on functional adjacencies/relationships and land use compatibility. 1
  - Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure.
  - Select site in area of high density.
  - Site facilities based on the strength of their relationships to other facilities/land-uses to limit travel distances. The stronger the relationship/functional interaction, the closer the distance between two facilities.
  - Select for distance to installation/base transit systems and access to pedestrian ways and bike paths.
  - Select for development previously used or developed suitable and available sites.

Technologies /Strategies: Screen potential building sites for these criteria and/or ensure that these criteria are addressed by the designer during the conceptual design phase. Utilize landscape architects, ecologists, environmental engineers, civil engineers, and similar professionals for the screening process. New wetlands constructed as part of stormwater mitigation or other site restoration efforts are not affected by the restrictions of this prerequisite.

---

[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

**1.C2** **Installation/Base Redevelopment** [1]

Intent: Channel development to installation/base cantonment areas with existing infrastructure, protecting greenfields and preserving habitat and natural resources.

Requirement:

- ❑ Increase localized density to conform to existing or desired density goals by utilizing sites that are located within existing cantonment areas of high development density. **1**
- ❑ Select sites close to existing roads and utilities or use an existing structure to minimize the need for new infrastructure. **1**

Technologies /Strategies: During the site selection process give preference to previously developed sites with installation/base cantonment redevelopment potential such as facility reduction program cleared sites.

**1.C3** **Brownfield Redevelopment** [1]

Intent: Rehabilitate damaged sites where development is complicated by real or perceived environmental contamination, reducing pressure on undeveloped land.

Requirement:

- ❑ Develop on a site classified as a brownfield and provide remediation as required by EPA's Brownfield Redevelopment program requirements OR Develop a brownfield site (a site that has been contaminated by previous uses). **1**

Technologies /Strategies: Screen potential damaged sites for these criteria prior to selection for rehabilitation.

Utilize EPA OSWER Directive 9610.17 and ASTM Standard Practice E1739 for site remediation where required.

**1.C4** **Alternative Transportation** [1]

Intent: Reduce pollution and land development impacts from automobile use.

Requirement:

- ❑ Locate building within ½ mile of installation/base transit systems. **1**
- ❑ Provide suitable means for securing bicycles, with convenient changing/shower facilities for use by cyclists, for 5% or more of building occupants. **1**
- ❑ Locate building within 2 miles of alternative-fuel refueling station(s). **1**
- ❑ Size parking capacity not to exceed minimum installation/base cantonment requirements AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants, OR, add no new parking for rehabilitation projects AND provide preferred parking for carpools or van pools capable of serving 5% of the building occupants. **1**

Technologies /Strategies: Select sites near public installation/base transit served by safe, convenient pedestrian pathways.

---

[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

**1.C5** **Reduced Site Disturbance** [1]

Intent: Conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity.

Requirement:

- ☐ On greenfield sites, limit site disturbance including earthwork and clearing of vegetation to 40 feet beyond the building perimeter, 5 feet beyond primary roadway curbs, walkways, and main utility branch trenches, and 25 feet beyond pervious paving areas that require additional staging areas in order to limit compaction in the paved area; OR, on previously developed sites, restore a minimum of 50% of the remaining open area by planting native or adapted vegetation. **1**
- ☐ Reduce the development footprint (including building, access roads and parking) to exceed the installation/base's/base's master plan local zoning's open space requirement for the site by 25% or in accordance with installation/base policy on open space set asides, whichever is greater. **1**

Technologies /Strategies: Note requirements on plans and in specifications. Establish contractual penalties for destruction of trees and site areas noted for protection. Reduce footprints by tightening program needs and stacking floor plans. Establish clearly marked construction and disturbance boundaries. Delineate laydown, recycling, and disposal areas. Use areas to be paved as staging areas. Work with local horticultural extension services, native plant societies, or installation/base agronomy staff to select indigenous plant species for site restoration and landscaping.

**1.C6** **Stormwater Management** [1]

Intent: Limit disruption of natural water flows by minimizing storm water runoff, increasing on-site infiltration and reducing contaminants.

Requirement: Implement a stormwater management plan that results in:

- ☐ No net increase in the rate or quantity of stormwater runoff from undeveloped to developed conditions; OR, if existing imperviousness is greater than 50%, implement a stormwater management plan that results in a 25% decrease in the rate and quantity of stormwater runoff. **1**
- ☐ Treatment systems designed to remove 80% of the average annual post development total suspended solids (TSS), and 40% of the average annual post development total phosphorous (TP), by implementing Best Management Practices (BMPs) outlined in EPA's Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA-840-B-92-002 1/93). **1**

Technologies /Strategies: Significantly reduce impervious surfaces, maximize on-site stormwater infiltration, and retain pervious and vegetated areas. Capture rainwater from impervious areas of the building for groundwater recharge or reuse within building. Use green/vegetated roofs. Utilize biologically-based and innovative stormwater management features for pollutant load reduction such as constructed wetlands, stormwater filtering systems, bioswales, bio-retention basins, and vegetated filter strips. Use open vegetated swales to reduce drainage velocity and erosion, reduce system maintenance, increase vegetative variety and support wildlife habitat where space permits.

**1.C7** **Landscape and Exterior Design to Reduce Heat Islands** [2]

Intent: Reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impact on microclimate and human and wildlife habitat.

Requirement:

- ☐ Provide shade (within 5 years) on at least 30% of non-roof impervious surface on the site, including parking lots, walkways, plazas, etc., OR, use light-colored/ high-albedo materials (reflectance of at least 0.3) for 30% of the site's non-roof impervious surfaces, OR place a minimum of 50% of parking space under-ground OR use open-grid pavement system (net impervious area of LESS than 50%) for a minimum of 50% of the parking lot area. **1**
- ☐ Use ENERGY STAR Roof compliant, high-reflectance AND low emissivity roofing (initial reflectance of at least .65 and three-year-aged reflectance of at least .5 when tested in accordance with ASTM E408) for a minimum of 75% of the roof surface; OR, install a "green" (vegetated) roof for at least 50% of the roof area. **1**

Technologies /Strategies: Employ design strategies, materials, and landscaping designs that reduce heat absorption of exterior materials. Note albedo/reflectance requirements in the drawings and specifications. Provide shade (calculated on June 21, noon solar time) using native or climate tolerant trees and large shrubs, vegetated trellises, or other exterior structures supporting vegetation. Substitute vegetated surfaces for hard surfaces. Explore elimination of blacktop and the use of new coatings and integral colorants for asphalt to achieve light colored surfaces.

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**1.C8** **Light Pollution Reduction** [1]

Intent: Eliminate light trespass from the building site, improve night sky access, and reduce development impact on nocturnal environments.

Requirement: ❑ Do not exceed Illuminating Engineering Society of North America (IESNA) footcandle level requirements as stated in the Recommended Practice Manual: Lighting for Exterior Environments, AND design interior and exterior lighting such that zero direct-beam illumination leaves the building site. 1

Technologies /Strategies: Consult IESNA Recommended Practice Manual: Lighting for Exterior Environments for Commission Internationle de l'Eclairage (CIE) zone and pre and post curfew hour descriptions and associated ambient lighting level requirements. Ambient lighting for pre-curfew hours for CIE zones range between .01 footcandles for areas with dark landscapes such as parks, rural, and residential areas, and 1.5 footcandles for areas with high ambient brightness such as installation/base areas with high levels of nighttime activity. Design site lighting and select lighting styles and technologies to have a minimal impact off-site and minimal contribution to sky glow. Minimize lighting of architectural and landscape features. Exterior lighting should be consistent with security lighting requirements.

**1.C9** **Optimize Site Features**

Intent: Optimize utilization of the site's existing natural features and placement of man-made features on the site.

Requirement: ❑ Perform both of the following: 1

- Maximize the use of free site energy.
- Plan facility, parking and roadways to "fit" existing site contours and limit cut and fill.

Technologies /Strategies: Evaluate site resources to ascertain how each can enhance the proposed project and visa versa. Work to maximum advantage of the site's solar and wind attributes. Use landscaping to optimize solar and wind conditions and to contribute to energy efficiency; Locate and orient the facility on the site to optimize solar and wind conditions.

**1.C10** **Facility Impact**

Intent: Minimize negative impacts on the site and on neighboring properties and structures; avoid or mitigate excessive noise, shading on green spaces, additional traffic, obscuring significant views, etc.

Requirement: ❑ Cluster facilities to reduce impact, access distance to utilities and sufficient occupant density to support mass transit. 1

❑ Collaborate with installation/base and community planners to identify and mitigate potential impacts of the project beyond site boundaries, and transportation planners to insure efficient public transport. 1

Technologies /Strategies: Involve local/regional planners and community members in installation/base master planning processes. Recognize the context and the impact of a project beyond site boundaries, and integrate it with the larger installation/base/community context/land use.

**1.C11** **Site Ecology**

Intent: Identify and mitigate all existing site problems including contamination of soil, water, and air, as well as any negative impacts caused by noise, eyesores, or lack of vegetation, enhancing or creating new site habitat.

Requirement: ❑ Develop site environmental management and mitigation plan. 1

Technologies /Strategies: Understand site and surrounding ecosystem interdependence and interconnectivity. Plan landscaping scheme to incorporate biodiversity. Preserve/enhance existing trees, hydrological features, ecosystems, habitats, and cultural resources. Increase the existence of healthy habitat for native species. Reintroduce native plants and trees where they have been destroyed by previous development.

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[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

## 2.0 Water Efficiency — Score 5

### 2.C1 Water Efficient Landscaping [2]

Intent: Limit or eliminate the use of potable water for landscape irrigation.

Requirement:

- ❑ Use high efficiency irrigation technology, OR, use captured rain or recycled site water to reduce potable water consumption for irrigation by 50% over conventional means. **1**
- ❑ Use only captured rain or recycled site water for an additional 50% reduction (100% total reduction) of potable water for site irrigation needs, OR, do not install permanent landscape irrigation systems. **1**

Technologies /Strategies: Develop a landscaping water use baseline according to the methodology outlined in the LEED Reference Guide. Specify water-efficient, native or adapted, climate tolerant plantings. High efficiency irrigation technologies include micro irrigation, moisture sensors, or weather data based controllers. Feed irrigation systems with captured rainwater, gray water, or on-site treated wastewater.

### 2.C2 Innovative Wastewater Technologies [2]

Intent: Reduce generation of wastewater and potable water demand, while increasing local aquifer recharge.

Requirement:

- ❑ Reduce the use of municipally provided potable water for building sewage conveyance by a minimum of 50%, OR, treat 100% of wastewater on site to tertiary standards. **1**

Technologies /Strategies: Develop a wastewater baseline according to the methodology outlined in the LEED Reference Guide. Implement decentralized on-site wastewater treatment and reuse systems. Decrease the use of potable water for sewage conveyance by utilizing gray and/or black water systems. Non-potable reuse opportunities include, toilet flushing, landscape irrigation, etc. Provide advanced wastewater treatment after use by employing innovative, ecological, on-site technologies including constructed wetlands, a mechanical recirculating sand filter, or aerobic treatment systems.

### 2.C3 Water Use Reduction [1]

Intent: Maximize water efficiency within buildings to reduce the burden on municipal water supply and wastewater systems.

Requirement:

- ❑ Employ strategies that in aggregate use 20% less water than the water use baseline calculated for the building (not including irrigation) after meeting Energy Policy Act (EPACT) of 1992 fixture performance requirements. **1**
- ❑ Exceed the potable water use reduction by an additional 10% (30% total efficiency increase). **1**

Technologies /Strategies: Develop a water use baseline including all water consuming fixtures, equipment, and seasonal conditions according to methodology guidance outlined in the LEED Reference Guide. Specify water conserving plumbing fixtures that exceed Energy Policy Act (EPACT) of 1992 fixture requirements in combination with ultra high efficiency or dry fixture and control technologies. Specify high water efficiency equipment (dishwashers, laundry, cooling towers, etc.). Use alternatives to potable water for sewage transport water. Use recycled or storm water for HVAC/process make up water. Install cooling tower systems designed to minimize water consumption from drift, evaporation and blowdown.

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## 3.0 Energy and Atmosphere — Score 28

### 3.R1 Fundamental Building Systems Commissioning [1] — Reqd.

Intent: Verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.

Requirement: ❑ Implement all of the following fundamental best practice commissioning procedures.

- Engage a commissioning authority.
- Develop design intent and basis of design documentation.
- Include commissioning requirements in the construction documents.
- Develop and utilize a commissioning plan.
- Verify installation, functional performance, training and documentation.
- Complete a commissioning report.

Technologies /Strategies: Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Perform additional commissioning in accordance with the DOE Building Commissioning Guide, Version 2.2. Refer to the LEED Reference Guide for detailed descriptions of required elements and references to additional commissioning guides. Specify pre-occupancy baseline IAQ testing at time of commissioning. Test for indoor air concentrations of CO, CO2, total VOCs and particulates. Test to assure that adequate ventilation rates have been achieved prior to initial occupancy.

### 3.R2 Minimum Energy Performance [1] — Reqd.

Intent: Establish the minimum level of energy efficiency for the base building and systems.

Requirement: ❑ Design to meet building energy efficiency and performance as required by TI 800-01 (Design Criteria).

Technologies /Strategies: Use building modeling and analysis techniques to establish and document compliance. ASHRAE/IESNA 90.1-1999 provides guidance for establishing building base case development and analysis. Refer to the LEED Reference Guide for a wide variety of energy efficiency strategy resources.

Use a professionally recognized and proven computer program or programs that integrate architectural features with air-conditioning, heating, lighting, and other energy producing or consuming systems. These programs will be capable of simulating the features, systems, and thermal loads used in the design. Using established weather data files, the program will perform 8760 hourly calculations. BLAST, DOE-2 or EnergyPlus are acceptable programs for these purposes.

### 3.R3 CFC Reduction in HVAC&R Equipment [2] — Reqd.

Intent: Reduce ozone depletion.

Requirement: ❑ Zero use of CFC-based refrigerants in new base building HVAC&R systems. When reusing existing base building HVAC equipment, complete a comprehensive CFC phaseout conversion.

Technologies /Strategies: Specify only non-CFC-based refrigerants in all base building HVAC&R systems.

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**3.C1** **Optimize Energy Performance** [1]

Intent: Achieve increasing levels of energy performance above the prerequisite standard to reduce environmental impacts associated with excessive energy use.

Requirement:

- ❑ Reduce design energy usage (DEU) compared to the energy use budget (EUB) in joules per square meter per year for regulated energy components as described in the requirements of Chapter 11 of the TI 800-01 (Design Criteria), as demonstrated by a whole building simulation. **20**
  - 1 Point will be awarded for every reduction in design energy use of 2.5% for both new and existing facilities for a maximum score of 20 points.

Regulated energy components include HVAC systems, building envelope, service hot water systems, lighting and other regulated systems as defined by ASHRAE.

Technologies /Strategies: Develop and use building modeling and analysis techniques to establish a base case that meets the minimum prerequisite standard. ASHRAE/IESNA 90.1-1999 provides guidance for establishing building base case development and analysis. Perform interactive energy use analysis for selected design elements that affect energy performance and document compliance.

Unit of measure for performance shall be annual energy usage in joules per square meter. Life-Cycle energy costs shall be determined using rates for purchased energy, such as electricity, gas, oil, propane, steam, and chilled water and approved by the adopting authority. Refer to the LEED Reference Guide or Whole Building Design Guide for a wide variety of energy efficiency resources and strategies including conservation measures, electromechanical energy efficiency technologies (for example ground-source heat pumps), passive heating and cooling strategies, solar hot water, and daylighting.

Life-Cycle costing will be done in accordance with 10 CFR 436.

Consider installation of an Energy Management and Control System (EMCS), which is compatible with exiting installation systems to optimize performance. Use sensors to control loads based on occupancy, schedule and/or the availability of natural resources use (day light or natural ventilation).

**3.C2** **Renewable Energy** [1]

Intent: Encourage and recognize increasing levels of self-supply through renewable technologies to reduce environmental impacts associated with fossil fuel energy use.

Requirement:

- ❑ Supply a net fraction of the building's total energy use through the use of on-site renewable energy systems.

| % of Total Annual Energy Usage in Renewables | |
|---|---|
| 5% | 1 |
| 10% | 2 |
| 15% | 3 |
| 20% | 4 |

Technologies /Strategies: Employ the use of on-site non-polluting-source renewable technologies contributing to the total energy requirements of the project. Consider and use high temperature solar and/or geothermal, photovoltaics, wind, biomass (other than unsustainably harvested wood), and bio-gas. Passive solar, solar hot water heating, ground-source heat pumps, and daylighting do not qualify for points under this credit. Credit for these strategies is given in Energy & Atmosphere Credit 1: Optimizing Energy Performance.

[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

**3.C3** **Additional Commissioning** [2]

Intent: Verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.

Requirement: ❑ In addition to the Fundamental Building Commissioning prerequisite, implement the following additional commissioning tasks: **1**

1. Conduct a focused review of the design prior to the construction documents phase.
2. Conduct a focused review of the construction documents when close to completion.
3. Conduct a selective review of contractor submittals of commissioned equipment.
4. Develop a system and energy management manual.
5. Have a contract in place for a near-warranty end or post occupancy review.

Items 1, 2, and 3 must be performed by someone other than the designer.

Technologies /Strategies: Introduce standards and strategies into the design process early, and then carry through selected measures by clearly stating target requirements in the construction documents. Tie contractor final payments to documented system performance. Refer to the LEED Reference Guide for detailed descriptions of required elements and references to additional guidelines.

**3.C4** **<< Deleted >>** [1]

**3.C5** **Measurement and Verification** [1]

Intent: Provide for the ongoing accountability and optimization of building energy and water consumption performance over time.

Requirement: ❑ Comply with the installed equipment requirements for continuous metering as stated in selected Measurement and Verification Methods - Option B: Retrofit Isolation of the US DOE's International Performance Measurement and Verification Protocol (IPMVP) for the following: **1**

- Lighting systems and controls.
- Constant and variable motor loads.
- Variable frequency drive (VFD) operation.
- Chiller efficiency at variable loads (kW/ton).
- Cooling load.
- Air and water economizer and heat recovery cycles.
- Air distribution static pressures and ventilation air volumes.
- Boiler efficiencies.
- Building specific process energy efficiency systems and equipment.
- Indoor water risers and outdoor irrigation systems.

Technologies /Strategies: Design and specify equipment to be installed in base building systems to allow for comparison, management, and optimization of actual vs. estimated energy and water performance. Employ building automation systems to perform M&V functions where applicable. Tie contractor final payments to documented M&V system performance and include in the commissioning report. Provide for ongoing M&V system maintenance and operating plan in building operations and maintenance manuals. Consider installation/base of an Energy Management and Control System (EMCS), which is compatible with exiting installation/base systems to optimize performance.

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**3.C6** **Green Power** [1]

Intent: Encourage the development and use of grid-source, renewable energy technologies on a net zero pollution basis.

Requirement: ❑ Engage in a two year contract to purchase the amount of power equal to projected building consumption generated from renewable sources that meet the Center for Resource Solutions (CRS) Green-E requirements. 1

Technologies /Strategies: Purchase power from a provider that guarantees a fraction of its delivered electric power is from net nonpolluting renewable technologies. Begin by contacting local utility companies. If the project is in an open market state, investigate Green Power and Power Marketers licensed to provide power in that state. Grid power that qualifies for this credit originates from solar, wind, geothermal, biomass, or low-impact hydro sources. Low-impact hydro shall comply with the Low Impact Hydropower Certification Program.

**3.C7** **Distributed Generation**

Intent: Encourage the development and use of distributed generation technologies, which are less polluting than grid-source energy.

Requirement: ❑ Reduce total energy usage and emissions by considering source energy implications and local cogeneration and direct energy conversion. Generate at least 50% of the building's projected annual consumption by on-site distributed generation sources. 1

Technologies /Strategies: Investigate the use of integrated generation and delivery systems, such as co-generation, fuel cells, micro-turbines and off-peak thermal storage.

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[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

**4.R1** **Storage & Collection of Recyclables** [1] **Reqd.**

Intent: Facilitate the reduction of waste generated by building occupants that is hauled to and disposed of in landfills.

Requirement:

- ❑ Provide an easily accessible area that serves the entire building that is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, glass, plastics, and metals.

Technologies /Strategies: Establish a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans in cooperation with users to encourage recycling. Reserve space for recycling functions early in the building occupancy programming process and show areas dedicated to collection of recycled materials on space utilization plans. Broader recycling support space considerations should allow for collection and storage of the required elements and newspaper, organic waste (food and soiled paper), and dry waste. When collection bins are used, bin(s) should be able to accommodate a 75% diversion rate and be easily accessible to custodial staff and recycling collection workers. Consider bin designs that allow for easy cleaning to avoid health issues.

**4.C1** **Building Reuse** [1]

Intent: Extend the life cycle of existing building stock, conserve resources, retain cultural resources, reduce waste, and reduce environmental impacts of new buildings as they relate to materials manufacturing and transport.

Requirement: Reuse large portions of existing structures during renovation or redevelopment projects.

- ❑ Maintain at least 75% of existing building structure and shell (exterior skin and framing excluding window assemblies). **1**
- ❑ Maintain an additional 25% (100% total) of existing building structure and shell (exterior skin and framing excluding window assemblies). **1**
- ❑ Maintain 100% of existing building structure and shell AND 50% non-shell (walls, floor coverings, and ceiling systems). **1**

Technologies /Strategies: Evaluate retention of existing structure. Consider facade preservation, particularly in installation/base areas. During programming and space planning, consider adjusting needs and occupant use patterns to fit within existing building structure and interior partition configurations. Identify and effectively address energy, structural, and indoor environmental (lead & asbestos) issues in building reuse planning and deconstruction documents. Percentage of reused non-shell building portions will be calculated as the total area (s.f.) of reused walls, floor covering, and ceiling systems, divided by the existing total area (s.f.) of walls, floor covering, and ceiling systems.

**4.C2** **Construction Waste Management** [1]

Intent: Divert construction, demolition, and land clearing debris from landfill disposal. Redirect recyclable material back to the manufacturing process.

Requirement: Develop and implement a waste management plan, quantifying material diversion by weight:

- ❑ Recycle and/or salvage at least 50% (by weight) of construction, demolition, and land clearing waste. **1**
- ❑ Recycle and/or salvage an additional 25% (75% total by weight) of the construction, demolition, and land clearing debris. **1**

Technologies /Strategies: Develop and specify a waste management plan which meets requirements of the installation/base environmental and/or solid waste management plans that identifies licensed haulers and processors of recyclables; identifies markets for salvaged materials; employs deconstruction, salvage, and recycling strategies and processes, includes waste auditing; and documents the cost for recycling, salvaging, and reusing materials. Source reduction on the job site should be an integral part of the plan.

The plan should address recycling of corrugated cardboard, metals, concrete brick, asphalt, land clearing debris (if applicable), beverage containers, clean dimensional wood, plastic, glass, gypsum board, and carpet; evaluate the cost-effectiveness of recycling rigid insulation, engineered wood products and other materials; hazardous materials storage and management; and participation in manufacturers' "take-back" programs to the maximum extent possible. Refer to the LEED Reference Guide for guidelines and references that provide waste management plan development and implementation support including model bid specifications.

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**4.C3** **Resource Reuse** [2]

Intent: Extend the life cycle of targeted building materials, reducing environmental impacts related to materials manufacturing and transport.

Requirement:

- ❑ Specify salvaged or refurbished materials for 5% of building materials. 1
- ❑ Specify salvaged or refurbished materials for 10% of building materials. 1

Technologies /Strategies: Commonly salvaged building materials include wood flooring/ paneling/cabinets, doors and frames, mantels, iron work and decorative lighting fixtures, brick, masonry and heavy timbers. See the LEED Reference Guide for calculation tools and guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars* (see exclusions) of the salvaged or refurbished material.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: In total dollar calculations, exclude; labor costs; all mechanical and electrical material and labor costs; and project overhead and fees. *If the cost of the salvaged or refurbished material is below market value, use replacement cost to estimate the material value, otherwise use actual cost to the project.

**4.C4** **Recycled Content** [1]

Intent: Increase demand for building products that have incorporated recycled content material, reducing the impacts resulting from extraction of new material.

Requirement:

- ❑ Specify a minimum of 25% of building materials that contain in aggregate a minimum weighted average of 20% post-consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material. 1
- ❑ Specify an additional 25% (50% total) of building materials that contain in aggregate, a minimum weighted average of 20% post consumer recycled content material, OR, a minimum weighted average of 40% post-industrial recycled content material. 1

Technologies /Strategies: Specify building materials containing recycled content for a fraction of total building materials. Select products and materials with supporting information from the AIA Resource Guide or the EPA Environmentally Preferable Purchasing (EPP) Program. Common building materials and products with recycled content include; wall, partition, and ceiling materials and systems; insulation; tiles and carpets; cement, concrete, and reinforcing metals; structural and framing steel. For products/materials not listed, selection should be made on the basis of EPP criterion and/or:

- Toxicity;
- Embodied energy;
- Production use of water, energy and ozone depleting substances (ODSs);
- Production limits on toxic emissions and effluents;
- Minimal, reusable or recycled/recyclable packaging;
- Impact on indoor environmental quality (IEQ);
- Installation that limits generation of waste;
- Materials that limit waste generation over their life;
- EPA guideline compliance; and
- Harvested on a sustainable yield basis.

See the LEED Reference Guide for a summary of the EPA guidelines and calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of the material that contain recycled content.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees)

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**4.C5** **Local/Regional Materials** [2]

Intent: Increase demand for building products that are manufactured locally, reducing the environmental impacts resulting from transportation, and supporting the local economy.

Requirement:

- ❑ Specify a minimum of 20% of building materials that are manufactured regionally within a radius of 500 miles. 1
- ❑ Of these regionally manufactured materials, specify a minimum of 50% that are extracted, harvested, or recovered within 500 miles. 1

Technologies /Strategies: Specify and install regionally extracted, harvested, and manufactured building materials. Contact the state and local waste management boards for information about regional building materials. See the LEED Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of material that is locally or regionally manufactured.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

**4.C6** **Rapidly Renewable Materials** [2]

Intent: Reduce the use and depletion of finite raw and long cycle renewable materials by replacing them with rapidly renewable materials.

Requirement:

- ❑ Specify rapidly renewable building materials for 5% of total building materials. 1

Technologies /Strategies: Rapidly renewable resources are those materials that substantially replenish them-selves faster than traditional extraction demand (e.g. planted and harvested in less than a 10 year cycle) and do not result in significant biodiversity loss, increase erosion, air quality impacts, and that are sustainably managed. See the LEED Reference Guide for calculation methodology guidelines. Determine percentages in terms of dollar value using the following steps:

1. Calculate total dollars (see exclusions) of materials that are considered to be rapidly renewable.
2. Calculate total dollars (see exclusions) of all building materials.
3. Divide Step 1 by Step 2 to determine the percentage.

Exclusions: Labor costs; all mechanical and electrical material and labor costs; project overhead and fees.

**4.C7** **Certified Wood** [2]

Intent: Encourage environmentally responsible forest management.

Requirement:

- ❑ Use a minimum of 50% of wood-based materials certified in accordance with the Forest Stewardship Council guidelines for wood building components including but not limited to framing, flooring, finishes, furnishings, and non-rented temporary construction applications such as bracing, concrete form work and pedestrian barriers. 1

Technologies /Strategies: Refer to the Forest Stewardship Council guidelines for wood building components that qualify for compliance to the requirements and incorporate into material selection for the project.

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## 5.0 Indoor Environmental Quality (IEQ) Score 17

**5.R1** **Minimum IAQ Performance** [1] **Reqd.**

Intent: Establish minimum IAQ performance to prevent the development of indoor air quality problems in buildings, maintaining the health and well being of the occupants.

Requirement: ❑ Meet the minimum requirements of voluntary consensus standard ASHRAE 62-1999, Ventilation for Acceptable Indoor Air Quality and approved Addenda.

Technologies /Strategies: Include proactive design details that will eliminate some of the common causes of indoor air quality problems in buildings. Introduce standards into the design process early. Incorporate references to targets in plans and specifications. Ensure ventilation system outdoor air capacity can meet standards in all modes of operation. Locate building outdoor air intakes (including operable windows) away from potential pollutants/contaminant sources such as sporulating plants (allergens), loading areas, building exhaust fans, cooling towers, sanitary vents, dumpsters, vehicular exhaust, and other sources. Include operational testing in the building commissioning report. Design cooling coil drain pans to ensure complete draining. Include measures to control and mitigate radon buildup in areas where it is prevalent. Limit humidity to a range that minimizes mold growth and promotes respiratory health.

**5.R2** **Environmental Tobacco Smoke (ETS) Control** [2] **Reqd.**

Intent: Prevent exposure of building occupants and systems to Environmental Tobacco Smoke (ETS).

Requirement: ❑ Zero exposure of nonsmokers to ETS by prohibition of smoking in the building, OR, by providing a designated smoking room designed to effectively contain, capture and remove ETS from the building. At a minimum, the smoking room shall be directly exhausted to the outdoors with no recirculation of ETS-containing air to the non-smoking area of the building, enclosed with impermeable structural deck-to-deck partitions and operated at a negative pressure compared with the surrounding spaces of at least 7 Pa (0.03 inches of water gauge). Performance of smoking rooms shall be verified using tracer gas testing methods as described in ASHRAE Standard 129-1997. Acceptable exposure in non-smoking areas is defined as less than 1% of the tracer gas concentration in the smoking room detectable in the adjoining non-smoking areas. Smoking room testing as described in the ASHRAE Standard 129-1997 is required in the contract documents and critical smoking facility systems testing results must be included in the building commissioning plan and report or as a separate document.

Technologies /Strategies: Prohibit smoking in the building and/or provide designated smoking areas outside the building in locations where ETS cannot reenter the building or ventilation system and away from high building occupant or pedestrian traffic.

**5.C1** **IAQ Monitoring** [1]

Intent: Provide capacity for indoor air quality (IAQ) monitoring to sustain long term occupant health and comfort.

Requirement: ❑ Install a permanent carbon dioxide ($CO_2$) monitoring system that provides feedback on space ventilation performance in a form that affords operational adjustments, AND specify initial operational set point parameters that maintain indoor carbon dioxide levels no higher than outdoor levels by more than 530 parts per million at any time. 1

Technologies /Strategies: Install an independent system or make $CO_2$ monitoring a function of the building automation system. Situate monitoring locations in areas of the building with high occupant densities and at the ends of the longest runs of the distribution ductwork. Specify that system operation manuals require calibration of all of the sensors per manufacturer recommendations but not less than one year. Include sensor and system operational testing and initial set point adjustment in the commissioning plan and report. Also consider periodic monitoring of carbon monoxide (CO), total volatile organic compounds (TVOCs), and particulates (including PM10).

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[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

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**5.C2** **Increase Ventilation Effectiveness** [2]

Intent: Provide for the effective delivery and mixing of fresh air to building occupants to support their health, safety, and comfort.

Requirement:

- ❑ For mechanically ventilated buildings, design ventilation systems that result in an air change effectiveness (E) greater than or equal to 0.9 as determined by ASHRAE 129-1997. For naturally ventilated spaces demonstrate a distribution and laminar flow pattern that involves not less than 90% of the room or zone area in the direction of air flow for at least 95% of hours of occupancy. 1

Technologies /Strategies: Employ architectural and HVAC design strategies to increase ventilation effectiveness and prevent short-circuiting of airflow delivery. Techniques available include use of displacement ventilation, low velocity, and laminar flow ventilation (under floor or near floor delivery) and natural ventilation. Operable windows with an architectural strategy for natural ventilation, cross ventilation, or stack effect can be appropriate options with study of inlet areas and locations. See the LEED Reference Guide for compliance methodology guidelines.

**5.C3** **Construction IAQ Management Plan** [2]

Intent: Prevent indoor air quality problems resulting from the construction/renovation process, to sustain long term installer and occupant health and comfort.

Requirement: Develop and implement an Indoor Air Quality (IAQ) Management Plan for the construction and pre-occupancy phases of the building as follows:

- ❑ During construction meet or exceed the minimum requirements of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guideline for Occupied Buildings under Construction, 1995, AND protect stored on-site or installed absorptive materials from moisture damage, AND replace all filtration media immediately prior to occupancy (Filtration media shall have a Minimum Efficiency Reporting Value (MERV) of 13 as determined by ASHRAE 52.2-1999). 1
- ❑ Conduct a minimum two-week building flushout with new filtration media at 100% outside air after construction ends and prior to occupancy, OR, conduct a baseline indoor air quality testing procedure consistent with current EPA protocol for Environmental Requirements, Baseline IAQ and Materials, for the Research Triangle Park Campus, Section 01445. 1

Technologies /Strategies: Specify containment control strategies including protecting the HVAC system, controlling pollutant sources, interrupting pathways for contamination, enforcing proper housekeeping and coordinating schedules to minimize disruption. Specify the construction sequencing to install absorptive materials after the prescribed dry or cure time of wet finishes to minimize adverse impacts on indoor air quality. Materials directly exposed to moisture through precipitation, plumbing leaks, or condensation from the HVAC system are susceptible to microbial contamination. Absorptive materials to protect and sequence installation include; insulation, carpeting, ceiling tiles, and gypsum products. Appoint an IEQ Manager with owner's authority to inspect IEQ problems and require mitigation as necessary.

**5.C4** **Low-Emitting Materials** [2]

Intent: Reduce the quantity of indoor air contaminants that are odorous or potentially irritating to provide installer and occupant health and comfort.

Requirement: Meet or exceed VOC limits for adhesives, sealants, paints, composite wood products, and carpet systems as follows:

- ❑ Adhesives must meet or exceed the VOC limits of South Coast Air Quality Management District Rule #1168 by, AND all sealants used as a filler must meet or exceed Bay Area Air Resources Board Reg. 8, Rule 51. 1
- ❑ Paints and coatings must meet or exceed the VOC and chemical component limits of Green Seal requirements. 1
- ❑ Carpet systems must meet or exceed the Carpet and Rug Institute Green Label Indoor Air Quality Test Program. 1
- ❑ Composite wood or agrifiber products must contain no added urea-formaldehyde resins. 1

Technologies /Strategies: Evaluate and preferentially specify materials that are low emitting, non-irritating, nontoxic and chemically inert. Request and evaluate emissions test data from manufacturers for comparative products. Ensure that VOC limits are clearly stated in specifications, in General Conditions, or in each section where adhesives, sealants, coatings, carpets, and composite woods are addressed.

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**5.C5** **Indoor Chemical and Pollutant Source Control** [1]

Intent: Avoid exposure of building occupants to potentially hazardous chemicals that adversely impact air quality.

Requirement:

- ☐ Design to minimize cross-contamination of regularly occupied areas by chemical pollutants: **1**
  - Employ permanent entryway systems (grills, grates, etc.) to capture dirt, particulates, etc. from entering the building at all high volume entryways, AND provide areas with structural deck to deck partitions with separate outside exhausting, no air recirculation and negative pressure where chemical use occurs (including housekeeping areas and copying/print rooms), AND provide drains plumbed for appropriate disposal of liquid waste in spaces where water and chemical concentrate mixing occurs.

Technologies /Strategies: Design to physically isolate activities associated with chemical contaminants from other locations in the building, providing dedicated systems to contain and remove chemical pollutants from source emitters at source locations. Applicable measures include eliminating or isolating high hazard areas; designing all housekeeping chemical storage and mixing areas (central storage facilities and janitors closets) to allow for secure product storage; designing copy/fax/printer/printing rooms with structural deck to deck partitions and dedicated exhaust ventilation systems; and including permanent architectural entryway system(s) to catch and hold particles to keep them from entering and contaminating the building interior.

Consider utilization of EPA registered anti-microbial treatments in carpet, textile or vinyl wall coverings, ceiling tiles or paints where microbial contamination is a concern. Utilize "breathable" wall finishes where circumstances require, to reduce moisture build-up and prevent microbial contamination. Minimize selection of fibrous materials, e.g. insulation, carpet and padding and flexible fabrics, whose exposed surfaces when exposed to the air stream or occupied space can contribute significant emissions and absorb and re-emit other contaminants over time.

**5.C6** **Controllability of Systems** [2]

Intent: Provide a high level of individual occupant control of thermal, ventilation, and lighting systems to support optimum health, productivity, and comfort conditions.

Requirement:

- ☐ Provide a minimum of one operable window and one lighting control zone per 200 s.f. for all occupied areas within 15 feet of the perimeter wall. **1**
- ☐ Provide controls for each individual for airflow, temperature, and lighting for 50% of the non perimeter, regularly occupied areas. **1**

Technologies /Strategies: Provide individual or integrated controls systems that control lighting, airflow, and temperature in individual rooms and/or work areas. Consider combinations of ambient and task lighting control and operable windows for perimeter and VAV systems for non perimeter with a 1:1: 2 terminal box to controller to occupant ratio.

**5.C7** **Thermal Comfort** [2]

Intent: Provide for a thermally comfortable environment that supports the productive and healthy performance of the building occupants.

Requirement:

- ☐ Comply with ASHRAE Standard 55-1992, Addenda 1995 for thermal comfort standards including humidity control within established ranges per climate zone. **1**
- ☐ Install a permanent temperature and humidity monitoring system configured to provide operators control over thermal comfort performance and effectiveness of humidification and/or dehumidification systems in the building. **1**

Technologies /Strategies: Integrated envelope and HVAC system design strategies that achieve thermal comfort conditions based on mean radiant temperature, local air velocity, relative humidity, and air temperature. Install and maintain a temperature and humidity monitoring system for key areas of the building (i.e., at the perimeter, and spaces provided with humidity control). This function can be satisfied by the building automation system. Specify in system operation manuals that all sensors require quarterly calibration. Include criteria verification and system operation in commissioning plan and report.

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[1] Adapted material not reviewed or endorsed by U. S. Green Building Council.

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**5.C8** **Daylight and Views** [2]

Intent: Provide a connection between indoor spaces and the outdoor environment through the introduction of sunlight and views into the occupied areas of the building.

Requirement:

- ❑ Achieve a minimum Daylight Factor of 2% (excluding all direct sunlight penetration) in 75% of all space occupied for critical visual tasks, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. Exceptions include those spaces where tasks would be hindered by the use of daylight or where accomplishing the specific tasks within a space would be enhanced by the direct penetration of sunlight. 1
- ❑ Direct line of sight to vision glazing from 90% of all regularly occupied spaces, not including copy rooms, storage areas, mechanical, laundry, and other low occupancy support areas. 1

Technologies /Strategies: Implement design strategies to provide access to daylight and views to the outdoors in a glare-free way using exterior sun shading, interior light shelves, and /or window treatments. Orient buildings to maximize daylighting options. Consider shallow or narrow building footprints. Employ courtyards, atriums, clerestory windows, skylights, and light shelves to achieve daylight penetration (from other than direct effect or direct rays from the sun) deep into regularly occupied areas of the building.

**5.C9** **Acoustic Environment /Noise Control**

Intent: Provide appropriate acoustic conditions for user privacy and comfort.

Requirement:

- ❑ Minimize environmental noise through appropriate use of insulation, sound-absorbing materials and noise source isolation. 1

Technologies /Strategies: Evaluate each occupied environment and determine the appropriate layout, materials and furnishings design.

**5.C10** **Facility In-Use IAQ Management Plan**

Intent: Insure the effective management of facility air quality during its life.

Requirement:

- ❑ Perform all of the following: 1
  - Develop an air quality action plan to include scheduled HVAC system cleaning.
  - Develop an air quality action plan to include education of occupants and facility managers on indoor pollutants and their roles in preventing them.
  - Develop an air quality action plan to include permanent monitoring of supply and return air, and ambient air at the fresh air intake, for carbon monoxide (CO), carbon dioxide (CO 2), total volatile organic compounds (TVOCs), and particulates (including PM10).

Technologies /Strategies: Provide action plan for periodic system maintenance, monitoring, occupant/manager training.

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**6.C1** **Holistic Delivery of Facility**

Intent: Encourage a facility delivery process that actively engages all stakeholders in the design process to deliver a facility that meets all functional requirements while effectively optimizing tradeoffs among sustainability, first costs, life cycle costs and mission requirements.

Requirement:

- ❑ Choose team leaders that are experienced in holistic delivery of facilities. **1**
- ❑ Train the entire team in the holistic delivery process. The team must include all stakeholders in the facility delivery, including the users, the contracting staff, the construction representatives, project manager, and design/engineering team members. **1**
- ❑ Identify project goals and metrics. **1**
- ❑ Plan and execute charrettes with team members at critical phases of the facility delivery. **1**
- ❑ Identify and resolve tradeoffs among sustainability, first costs, life cycle costs and mission requirements through charrettes and other collaborative processes. **2**
- ❑ Document required results for each phase of project deliverables that achieve the project goals and are measurable throughout the facility life span. **1**

Technologies /Strategies:

Develop performance specifications or choose competitive range of products that meet environmental criteria.

Use automated modeling and analysis tools to assess site and facility design alternatives.

Conduct life-cycle cost analysis (LCCA) in the design process according to the Federal Facilities Council Technical Report, Sustainable Federal Facilities: A Guide To Integrating Value Engineering, Life Cycle Costing, and Sustainable Development, FFC # 142, 2000.

Conduct a full ecological assessment to include soil quality, water resources and flows, vegetation and trees, wildlife habitats and corridors, wetlands, and ecologically sensitive areas to identify the least sensitive site areas for development. Evaluate space utilization/functions to reduce overall space requirements, considering networking, flextime, flexi-place, dual-use, and other strategies to reduce space requirements/optimize facility size.

## 7.0 Current Mission — Score 6

### 7.C1 Operation and Maintenance

Intent: Encourage the development of a facility delivery process that enhances efficient operation and maintenance of the facility.

Requirement:

- ❑ Develop a facility operations and maintenance program to include: **2**
  - Commissioning instructions for all facility systems.
  - Comprehensive facility operations and maintenance instructions for system operation, performance verification procedures and results, an equipment inventory, warrantee information, and recommended maintenance schedule. The instructions should include a comprehensive, preventive maintenance program to keep all facility systems functioning as designed.
  - A periodic training program for occupants, facilities managers, and maintenance staff in all facility operations and maintenance activities.
  - Instructions on sustainable cleaning and pest control practices.
  - Develop a comprehensive site/facility recycling/waste management plan.
- ❑ Provide surfaces, furnishings, and equipment that are appropriately durable, according to life cycle cost analysis. **1**

Technologies /Strategies: Maintain facility elements, systems and subsystems on a routine maintenance schedule to ensure integrity and longevity.

Perform scheduled cleaning and maintenance activities with nontoxic environmentally preferable cleaning products and procedures. Keep air ducts clean and free of microorganisms through a structured program of preventive maintenance. Clean lighting systems following a regular maintenance schedule to ensure optimum light output and energy efficiency.

Use pesticides and herbicides sparingly and only when necessary with preference to natural methods and materials over poisons and toxic agents.

Use automated monitors and controls for energy, water, waste, temperature, moisture, and ventilation monitors and controls. Turn off the lights, computers, computer monitors, and equipment when not in use. Enable power-down features on office equipment.

### 7.C2 Soldier and Workforce Productivity and Retention

Intent: Provide a high-quality, functional, healthy and safe work environment to promote soldier and workforce productivity and retention.

Requirement:

- ❑ Provide a high quality indoor environment to enhance user/occupant quality of life (QOL). **1**
- ❑ Provide a highly functional work environment to promote user/occupant work productivity. **1**
- ❑ Provide a healthy and safe work environment to sustain QOL and productivity. **1**

Technologies /Strategies: Use a registered/certified interior designer to provide stimulating interior environments with pleasant colors, surface treatments, room proportions and ceiling heights, external views, natural lighting, and quality detailing for interior furnishings, equipment, materials and finishes. Use IES standards to provide light to occupied space with variations in level, comfortable contrasts, natural color rendition, natural/man-made, and adequate controls to optimize light aesthetic qualities. Provide occupant control of individual work areas configuration, and lighting, thermal and ventilation systems.

Collaborate with end users to identify functional and technical requirements and to perform adjacency studies. Configure occupied space to address the specific workers/occupants functions and activities that will be carried out there. Meet TI 800-01 Design Guide requirements. Design and configure occupied space, and select furniture and equipment using human ergonomics. Identify existing user amenities, such as dining, recreation, socialization, shopping and child care facilities. Identify what amenities should be incorporated into the project or provided in the future, nearby facility. Provide ventilation air in sufficient volume free from natural and man made contaminants.

## 8.0 Future Missions — Score 4

### 8.C1 Functional Life of Facility and Supporting Systems

Intent: Assess the functional life of a facility and its supporting systems to optimize the infrastructure investment.

Requirement:

- ❑ Identify how long the designed function is likely to occupy the current facility. **1**
- ❑ Identify how long the envelope, structure, HVAC, plumbing, communications, electrical, and other systems are likely to last before requiring replacement or upgrade. Consider economic, functional and physical obsolescence. **1**

Technologies /Strategies: Assess the typical or likely lifespan of the function(s) to be accommodated to forecast eventual adaptation to a different use(s). Assess the life spans of the various building systems/components to forecast their revision/replacement during the facility lifespan and design in a manner that facilitates revision/replacement.

Consider the life span of the weapon systems, doctrines, or other programs supported by the facility.

Use life cycle data and other sources to identify the life span of the embodied systems.

### 8.C2 Adaptation, Renewal and Future Uses

Intent: Encourage facility design that is responsive to change over time to maximize accommodation of future uses without creating waste and insuring maximum useful life of products.

Requirement:

- ❑ Identify possible future uses for the facility; consider alternatives that expand the list of possible future uses. AND Design the building to accommodate as wide a range of future uses, as practical. AND Design the installation of building systems to accommodate foreseeable change with a minimum amount of disruption, cost, and additional materials. **1**
- ❑ Build the smallest facility necessary to meet current mission functional requirements, using the most efficient shape and form, while taking into consideration expansion capabilities and potential future mission requirements. AND Design the facility for recycling of materials and systems. **1**

Technologies /Strategies: Create durable, long-lasting and adaptable facility shell and structural system. Create an adaptable, flexible facility design using open planning, service corridors, interstitial space, access floors, demountable walls/partitions, modular furniture and other adaptable space configuration/utilization strategies.

Select materials that are recyclable, avoiding composite materials, such as reinforced plastics and carpet fibers and backing. Consider selecting materials and labeling construction materials with identification information to facilitate recycling. Use pre-cut/pre-fabricated materials and use standard lengths and sizes (dimensional modularity) in design. Design facility systems and subsystems for reconfiguration and/or disassembly/recycling using reversible/reusable connectors.

# Facility Points Summary

| | | | | |
|---|---|---|---|---|
| **1.0** | **Sustainable Sites (S)** | **Score** | **0** | **Max 20** |
| 1.R1 | ❑ Erosion, Sedimentation and Water Quality Control | | | [Required] |
| 1.C1 | ❑ Site Selection | | | 2 |
| 1.C2 | ❑ Installation/Base Redevelopment | | | 2 |
| 1.C3 | ❑ Brownfield Redevelopment | | | 1 |
| 1.C4 | ❑ Alternative Transportation | | | 4 |
| 1.C5 | ❑ Reduced Site Disturbance | | | 2 |
| 1.C6 | ❑ Stormwater Management | | | 2 |
| 1.C7 | ❑ Landscape and Exterior Design to Reduce Heat Islands | | | 2 |
| 1.C8 | ❑ Light Pollution Reduction | | | 1 |
| 1.C9 | ❑ Optimize Site Features | | | 1 |
| 1.C10 | ❑ Facility Impact | | | 2 |
| 1.C11 | ❑ Site Ecology | | | 1 |
| **2.0** | **Water Efficiency (W)** | **Score** | **0** | **Max 5** |
| 2.C1 | ❑ Water Efficient Landscaping | | | 2 |
| 2.C2 | ❑ Innovative Wastewater Technologies | | | 1 |
| 2.C3 | ❑ Water Use Reduction | | | 2 |
| **3.0** | **Energy and Atmosphere (E)** | **Score** | **0** | **Max 28** |
| 3.R1 | ❑ Fundamental Building Systems Commissioning | | | [Required] |
| 3.R2 | ❑ Minimum Energy Performance | | | [Required] |
| 3.R3 | ❑ CFC Reduction in HVAC&R Equipment | | | [Required] |
| 3.C1 | ❑ Optimize Energy Performance | | | 20 |
| 3.C2 | ❑ Renewable Energy | | | 4 |
| 3.C3 | ❑ Additional Commissioning | | | 1 |
| 3.C4 | ❑ <<Deleted>> | | | |
| 3.C5 | ❑ Measurement and Verification | | | 1 |
| 3.C6 | ❑ Green Power | | | 1 |
| 3.C7 | ❑ Distributed Generation | | | 1 |
| **4.0** | **Materials and Resources (M)** | **Score** | **0** | **Max 13** |
| 4.R1 | ❑ Storage & Collection of Recyclables | | | [Required] |
| 4.C1 | ❑ Building Reuse | | | 3 |
| 4.C2 | ❑ Construction Waste Management | | | 2 |
| 4.C3 | ❑ Resource Reuse | | | 2 |
| 4.C4 | ❑ Recycled Content | | | 2 |
| 4.C5 | ❑ Local/Regional Materials | | | 2 |
| 4.C6 | ❑ Rapidly Renewable Materials | | | 1 |
| 4.C7 | ❑ Certified Wood | | | 1 |
| **5.0** | **Indoor Environmental Quality (IEQ) [Q]** | **Score** | **0** | **Max 17** |
| 5.R1 | ❑ Minimum IAQ Performance | | | [Required] |
| 5.R2 | ❑ Environmental Tobacco Smoke (ETS) Control | | | [Required] |
| 5.C1 | ❑ IAQ Monitoring | | | 1 |
| 5.C2 | ❑ Increase Ventilation Effectiveness | | | 1 |
| 5.C3 | ❑ Construction IAQ Management Plan | | | 2 |
| 5.C4 | ❑ Low-Emitting Materials | | | 4 |
| 5.C5 | ❑ Indoor Chemical and Pollutant Source Control | | | 1 |
| 5.C6 | ❑ Controllability of Systems | | | 2 |
| 5.C7 | ❑ Thermal Comfort | | | 2 |
| 5.C8 | ❑ Daylight and Views | | | 2 |
| 5.C9 | ❑ Acoustic Environment /Noise Control | | | 1 |
| 5.C10 | ❑ Facility In-Use IAQ Management Plan | | | 1 |

## Facility Points Summary (Continued)

| | | | | Maximum Points |
|---|---|---|---|---|
| 6.0 | Facility Delivery Process (P) | Score | 0 | Max 7 |
| 6.C1 | ❑ Holistic Delivery of Facility | | | 7 |
| 7.0 | Current Mission | Score | 0 | Max 6 |
| 7.C1 | ❑ Operation and Maintenance | | | 3 |
| 7.C2 | ❑ Soldier and Workforce Productivity and Retention | | | 3 |
| 8.0 | Future Missions | Score | 0 | Max 4 |
| 8.C1 | ❑ Functional Life of Facility and Supporting Systems | | | 2 |
| 8.C2 | ❑ Adaptation, Renewal and Future Uses | | | 2 |

**Total Score** 0 Max 100

## SPiRiT Sustainable Project Certification Levels

| | | |
|---|---|---|
| **SPiRiT Bronze** | | **25 to 34 Points** |
| **SPiRiT Silver** | | **35 to 49 Points** |
| **SPiRiT Gold** | | **50 to 74 Points** |
| **SPiRiT Platinum** | | **75 to 100 Points** |

## Project Points of Contact

## SPiRiT Comment Sheet

Please forward any comments that you may have on this Sustainable Project Rating Tool, preferably by Email, to:

Mr. Harry Goradia
U. S. Army Corps of Engineers
ATTN: CEMP-ET
441 G Street NW
Washington, DC 20314
Phone (202) 761-7170, FAX (202) 761-0633
Email harry.goradia@hq02.usace.army.mil

SPiRiT Para.

ATTACHMENT 14

# RFP LIST OF DRAWINGS

FY03 MCA PN52068 & BUP PN52069, PHASE 3A
WHOLE BARRACKS RENEWAL BRIGADE COMPLEX, QUAD C
SCHOFIELD BARRACKS, OAHU, HAWAII

**RFP LIST OF DRAWINGS**

| RING NO. | DRAWING NUMBER | SHEET NUMBER | DESCRIPTION OF DRAWINGS |
|---|---|---|---|
| | | | |
| | | | TITLE SHEET |
| | | | |
| 1 | N/A | T-1 | COVER SHEET, INDEX TO DRAWINGS |
| 2 | N/A | T-2 | SITE PLAN, GENERAL NOTES, ABBREVIATIONS, LEGEND, & GROSS FLOOR AREA TABLE |
| 3 | N/A | A-1.1 | FLOOR PLAN - BLDG 355 FIRST & SECOND FLOOR |
| 4 | N/A | A-1.2 | FLOOR PLAN - BLDG 355 THIRD FLOOR |
| 5 | N/A | A-1.3 | SECTIONS - BLDG 355, BRACKET PROFILE, & ELEVATOR SECTION |
| 6 | N/A | A-1.4 | EXTERIOR ELEVATIONS - BLDG 355 |
| 7 | N/A | A-2.1 | FLOOR PLAN - BLDG 356 & 358 FIRST - THIRD FLOOR |
| 8 | N/A | A-2.2 | FLOOR PLAN - BLDG 356 & 358 1 + 1 UNIT AND SINGLE UNIT |
| 9 | N/A | A-2.3 | SECTIONS - BLDG 356 & 358, BRACKET PROFILE |
| 10 | N/A | A-2.4 | EXTERIOR ELEVATIONS - BLDG 356 & 358 |
| 11 | N/A | A-3.1 | FLOOR PLAN - BLDG 357 FIRST & SECOND FLOOR |
| 12 | N/A | A-3.2 | FLOOR PLAN - BLDG 357 THIRD FLOOR |
| 13 | N/A | A-3.3 | SECTIONS - BLDG 357 |
| 14 | N/A | A-3.4 | EXTERIOR ELEVATIONS - BLDG 357 |
| 15 | N/A | A-4.1 | DOOR AND WINDOW DETAILS |
| 16 | N/A | C-1 | DEMOLITION PLAN |
| 17 | N/A | C-2 | UTILITY DEMOLITION PLAN |
| 18 | N/A | C-3 | SITE PLAN |
| 19 | N/A | C-4 | UTILITY PLAN |
| 20 | N/A | C-5 | DRAINAGE PLAN |
| 21 | N/A | M-1 | SITE MECHANICAL PLAN |
| 22 | N/A | M-2 | BUILDING 355 - FIRST AND SECOND FLOOR VAC PLANS |
| 23 | N/A | M-3 | BUILDING 355 THIRD FLOOR VAC PLAN |
| 24 | N/A | M-4 | BUILDING 356 & 358 - FIRST AND SECOND FLOOR VAC PLAN |
| 25 | N/A | M-5 | BUILDING 356 & 358 - THIRD FLOOR VAC PLAN |
| 26 | N/A | M-6 | BUILDING 357 - FIRST AND SECOND FLOOR VAC PLANS |
| 27 | N/A | M-7 | BUILDING 357 - THIRD FLOOR VAC PLAN |

**RFP LIST OF DRAWINGS**

| | | | |
|---|---|---|---|
| 28 | N/A | P-1 | BUILDING 355 - FIRST AND SECOND FLOOR PLUMBING PLANS |
| 29 | N/A | P-2 | BUILDING 355 - THRID FLOOR PLUMBING PLAN |
| 30 | N/A | P-3 | BUILDING 356 & 358 - FIRST AND SECOND FLOOR PLUMBING PLANS |
| 36 | N/A | P-4 | BUILDING 356 & 358 - THIRD FLOOR AND DETAILED PLUMBING PLANS |
| 37 | N/A | P-5 | BUILDING 357 - FIRST AND SECOND FLOOR PLUMBING PLANS |
| 38 | N/A | P-6 | BUILDING 357 - THIRD FLOOR PLUMBING PLAN |
| 39 | N/A | FP-1 | FIRE PROTECTION NOTES, SYMBOL LEGEND AND LEGEND AND ABBREVIATIONS |
| 40 | N/A | FP-2 | BUILDING 355 FIRST AND SECOND FLOOR FIRE PROTECTION PLANS |
| 41 | N/A | FP-3 | BUILDING 355 THIRD FLOOR FIRE SUPPRESSION PLAN |
| 42 | N/A | FP-4 | BUILDING 356 & 358 FIRST AND SECOND FLOOR FIRE PROTECTION PLANS |
| 43 | N/A | FP-5 | BUILDING 356 & 358 THIRD FLOOR FIRE SUPPRESSION PLAN |
| 44 | N/A | FP-6 | BUILDING 357 FIRST AND SECOND FLOOR FIRE PROTECTION PLANS |
| 45 | N/A | FP-7 | BUILDING 357 THIRD FLOOR FIRE SUPPRESSION PLAN |
| 46 | N/A | E-1 | ELECTRICAL SITE PLAN |
| 47 | N/A | E-2 | SCHEMATIC PRIMARY ELECTRICAL DIAGRAM |
| 48 | N/A | E-3 | TYPICAL CATV RISER CONDUIT HOMERUN SYSTEM |
| 49 | N/A | K-1 | BUILDING 357 - FIRST FLOOR FOOD SERVICE EQUIPMENT SCHEDULE |
| 50 | N/A | K-2 | BUILDING 357 - FIRST FLOOR FOOD SERVICE EQUIPMENT SCHEDULE |
| 51 | N/A | K-3 | BUILDING 357 - FIRST FLOOR FOOD SERVICE EQUIPMENT SCHEDULE |
| 52 | N/A | K-4 | BUILDING 357 - FIRST FLOOR SERVICE EQUIPMENT PLAN |
| 53 | N/A | K-5 | BUILDING 357 - FIRST FLOOR SERVICE EQUIPMENT PARTIAL PLAN |
| 54 | N/A | K-6 | BUILDING 357 - FIRST FLOOR SERVICE EQUIPMENT PARTIAL PLAN |
| 55 | N/A | K-7 | BUILDING 357 - FIRST FLOOR SERVICE EQUIPMENT PARTIAL PLAN |
| 56 | N/A | L-1 | LANDSCAPE MASTER PLAN |
| | | | |
| | | | |
| | | | |

ATTACHMENT 15

PROPOSAL DATA SHEET

**PROPOSAL DATA SHEET**
[PROJECT TITLE]
[PROJECT LOCATION]

| Note to Design Activity |
| --- |
| Inclusion of the Performance Capability Data Sheet in the RFP is the USACE design activity's option. Requirements for demonstration of offeror capability are stated in the RFP Section 00110. The performance capability evaluation is also referred to as STEP 1 in RFP Section 00120, EVALUATION CRITERIA FOR TECHNICAL PROPOSALS. When using the following coordinate with APPENDIX A of the Project Management Manual (Volume 1), STEP 1 OFFEROR PROPOSAL EVALUATION MANUAL. |

| Note to Offerors |
| --- |
| This OFFEROR PERFORMANCE CAPABILITY PROPOSAL DATA SHEET must be completed and attached as the first page of the body of your proposal. The information required by this data sheet may be completed directly on this form or attached to the form as supplemental data sheets. |

**1. NAME OF OFFEROR.**

Name of Offeror(s):

If a joint venture or contractor-subcontractor association of firms, list the individual firms and briefly describe the nature of the association.

Firm 1:
Firm 2:
Firm 3:
Firm 4:

Nature of Association:

**2. AUTHORIZED NEGOTIATORS.** FAR 52.215-11

The offeror or quoter represents that the following persons are authorized to negotiate on its behalf with the Government in connection with this Request for Proposals (RFP) or quotations.

[List names, titles, and telephone number of the authorized negotiator.]

Name of Person Authorized to Negotiate:

Contact's Address:

Contact's Telephone:

**PROPONENT.** If different from 2. above.

Name:
Address:

Telephone:

**3. PROJECT EXAMPLES.** On an attached sheet, list (preferably three) projects of similar design that have been done by the offeror. List date of construction completion, address of building(s), address and telephone number of owner. Indicate type of project (private sector, Government, planned unit development, etc.), general character, total cost, and total cost of all modifications. If offeror is made up of separate design and construction companies that have combined for this project, then this item must be completed twice (once for each company).

a. On an attached sheet, list any projects within the last five years that have been assessed liquidated damages. Provide explanation.

b. On an attached sheet, list any projects within the last five years that have been terminated. Provide explanation.

c. On an attached sheet, list all contracts with the Government within the last five years. Indicate Government contract number and contracting agency (with contact names and telephone numbers).

**4. PERSONNEL WITH PRINCIPAL RESPONSIBILITY.** Include a brief resume for each person listed on an attached sheet.

| KEY DESIGN PERSONNEL | | |
|---|---|---|
| Position | Name | State of Registration |
| Project Manager | | |
| Architect | | |
| Landscape Architect | | |
| Structural Engineer | | |
| Electrical Engineer | | |
| Mechanical Engineer | | |
| Civil/Site Engineer | | |
| Geotechnical Engineer | | |
| Other (e.g., Kitchen Designer) | | |

| KEY CONSTRUCTION PERSONNEL | | |
|---|---|---|
| Position | Name | Type of Registration & State |
| Quality Control Manager | | |
| Construction Manager | | |
| Superintendent (if different) | | |

a. On a separate sheet, list current contracts by nature, duration, and amount, including those for which your firm is now competing or negotiating. Describe the impact of such work on this project if you are determined to be the successful proposer. Furnish a curve with the record of placement of your firm over the past three years, and your projection for the next two years. Provide a statement of the priority of this project relative to other current and anticipated commitments. Indicate the type and extent of home office support you contemplate for this project on a regular and contingency basis.

b. Indicate the approximate number of people currently on company payroll in design and construction.

c. Indicate the approximate number of people you think will be available to work on this project in both design and construction.

d. Indicate the approximate workload currently in your office in both design and construction.

(1) In Design:_____No. Projects: _____ U.S. Dollar Volume:

(2) In Construction:_____ No. Projects: _____ U.S. Dollar Volume:

e. Indicate your office capabilities for using CADD (Computer Aided Design and Drafting) and other forms of automation on this project.

f. You may provide additional information on your capabilities, but please be brief.

**5. MANAGEMENT PLAN AND QUALITY CONTROL PLAN.** Provide your Management Plan. The term "Management Plan" is defined as a plan that includes the following subplans:

Quality Control Plan.
Design Schedule.
Construction Schedule (Network Analysis).
Contract Closeout Plan.

**6. OTHER FACTORS.**

a. Has the offeror's staff visited the project site?

b. Did offeror attend pre-proposal site visit?

ATTACHMENT 16

# UFGS SECTION 13280A ASBESTOS ABATEMENT

SECTION TABLE OF CONTENTS

DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13280A

ASBESTOS ABATEMENT

PART 1 GENERAL

1.1 REFERENCES
1.2 DEFINITIONS
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# SECTION 13280A

# ASBESTOS ABATEMENT

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

| | |
|---|---|
| ANSI Z87.1 | (1989; Errata; Z87.1a) Occupational and Educational Eye and Face Protection |
| ANSI Z88.2 | (1992) Respiratory Protection |
| ANSI Z9.2 | (1979; R 1991) Fundamentals Governing the Design and Operation of Local Exhaust Systems |

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM C 732 | (1995) Aging Effects of Artificial Weathering on Latex Sealants |
| ASTM D 1331 | (1989; R 1995) Surface and Interfacial Tension of Solutions of Surface-Active Agents |
| ASTM D 4397 | (1996) Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications |
| ASTM E 1368 | (2000) Visual Inspection of Asbestos Abatement Projects |
| ASTM E 84 | (2000a) Surface Burning Characteristics of Building Materials |
| ASTM E 96 | (2000) Water Vapor Transmission of Materials |

COMPRESSED GAS ASSOCIATION (CGA)

| | |
|---|---|
| CGA G-7 | (1990) Compressed Air for Human Respiration |
| CGA G-7.1 | (1997) Commodity Specification for Air |

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

| | |
|---|---|
| NIOSH Pub No. 84-100 | (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual |

HAWAII ADMINISTRATIVE RULES, TITLE II (HAR)

| | |
|---|---|
| HAR Chapter 501 | Asbestos Requirements |
| HAR Chapter 502 | Asbestos Containing Materials in Schools |
| HAR Chapter 503 | Fees for Asbestos Removal & Certification |
| HAR Chapter 504 | Asbestos Abatement Certification Program |

HAWAII STATE OCCUPATIONAL SAFETY AND HEALTH (HIOSH)

| | |
|---|---|
| HIOSH 12-145 | Asbestos |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
|---|---|
| EPA 340/1-90/018 | (1990) Asbestos/NESHAP Regulated Asbestos Containing Materials Guidance |
| EPA 340/1-90/019 | (1990) Asbestos/NESHAP Adequately Wet Guidance |
| EPA 560/5-85-024 | (1985) Guidance for Controlling Asbestos-Containing Materials in Buildings |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

| | |
|---|---|
| 29 CFR 1910 | Occupational Safety and Health Standards |
| 29 CFR 1926 | Safety and Health Regulations for Construction |
| 40 CFR 61 | National Emission Standards for Hazardous Air Pollutants |
| 40 CFR 763 | Asbestos |
| 42 CFR 84 | Approval of Respiratory Protective Devices |
| 49 CFR 107 | Hazardous Materials Program Procedures |
| 49 CFR 171 | General Information, Regulations, and Definitions |
| 49 CFR 172 | Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements |
| 49 CFR 173 | Shippers - General Requirements for Shipments and Packagings |

UNDERWRITERS LABORATORIES (UL)

UL 586 (1996; Rev thru Aug 1999) High-Efficiency, Particulate, Air Filter Units

1.2 DEFINITIONS

a. Adequately Wet: A term defined in 40 CFR 61, Subpart M, and EPA 340/1-90/019 meaning to sufficiently mix or penetrate with liquid to prevent the release of particulate. If visible emissions are observed coming from asbestos-containing material (ACM), then that material has not been adequately wetted. However, the absence of visible emissions is not sufficient evidence of being adequately wetted.

b. Aggressive Method: Removal or disturbance of building material by sanding, abrading, grinding, or other method that breaks, crumbles, or disintegrates intact asbestos-containing material (ACM).

c. Amended Water: Water containing a wetting agent or surfactant with a surface tension of at least 29 dynes per square centimeter when tested in accordance with ASTM D 1331.

d. Asbestos: Asbestos includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophylite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered.

e. Asbestos-Containing Material (ACM): Any materials containing more than one percent asbestos.

f. Asbestos Fiber: A particulate form of asbestos, 5 micrometers or longer, with a length-to-width ratio of at least 3 to 1.

g. Authorized Person: Any person authorized by the Contractor and required by work duties to be present in the regulated areas.

h. Building Inspector: Individual who inspects buildings for asbestos and has EPA Model Accreditation Plan (MAP) "Building Inspector" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.

i. Certified Industrial Hygienist (CIH): An Industrial Hygienist certified in the practice of industrial hygiene by the American Board of Industrial Hygiene.

j. Class I Asbestos Work: Activities defined by OSHA involving the removal of thermal system insulation (TSI) and surfacing ACM.

k. Class II Asbestos Work: Activities defined by OSHA involving the removal of ACM which is not thermal system insulation or surfacing material. This includes, but is not limited to, the removal of asbestos - containing wallboard, floor tile and sheeting, roofing and siding shingles, and construction mastic. Certain "incidental" roofing materials such as mastic, flashing and cements when they are still intact are excluded from Class II asbestos work. Removal of small amounts of these materials which would fit into a glovebag may be classified as a Class III job.

l. Class III Asbestos Work: Activities defined by OSHA that involve repair and maintenance operations, where ACM, including TSI and surfacing ACM, is likely to be disturbed. Operations may include drilling, abrading, cutting a hole, cable pulling, crawling through tunnels or attics and spaces above the ceiling, where asbestos is actively disturbed or asbestos-containing debris is actively disturbed.

m. Class IV Asbestos Work: Maintenance and custodial construction activities during which employees contact but do not disturb ACM and activities to clean-up dust, waste and debris resulting from Class I, II, and III activities. This may include dusting surfaces where ACM waste and debris and accompanying dust exists and cleaning up loose ACM debris from TSI or surfacing ACM following construction.

n. Clean room: An uncontaminated room having facilities for the storage of employees' street clothing and uncontaminated materials and equipment.

o. Competent Person: In addition to the definition in 29 CFR 1926, Section .32(f), a person who is capable of identifying existing asbestos hazards as defined in 29 CFR 1926, Section .1101, selecting the appropriate control strategy, has the authority to take prompt corrective measures to eliminate them and has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.

p. Contractor/Supervisor: Individual who supervises asbestos abatement work and has EPA Model Accreditation Plan "Contractor/Supervisor" training; accreditation required by 40 CFR 763, Subpart E, Appendix C.

q. Critical Barrier: One or more layers of plastic sealed over all openings into a regulated area or any other similarly placed physical barrier sufficient to prevent airborne asbestos in a regulated area from migrating to an adjacent area.

r. Decontamination Area: An enclosed area adjacent and connected to the regulated area and consisting of an equipment room, shower area, and clean room, which is used for the decontamination of workers, materials, and equipment that are contaminated with asbestos.

s. Demolition: The wrecking or taking out of any load-supporting structural member and any related razing, removing, or stripping of asbestos products.

t. Disposal Bag: A 6 mil thick, leak-tight plastic bag, pre-labeled in accordance with 29 CFR 1926, Section .1101, used for transporting asbestos waste from containment to disposal site.

u. Disturbance: Activities that disrupt the matrix of ACM, crumble or pulverize ACM, or generate visible debris from ACM. Disturbance includes cutting away small amounts of ACM, no greater than the amount which can be contained in 1 standard sized glovebag or waste bag, not larger than 60 inches in length and width in order to access a building component.

v. Equipment Room or Area: An area adjacent to the regulated area used for the decontamination of employees and their equipment.

w. Employee Exposure: That exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment.

x. Fiber: A fibrous particulate, 5 micrometers or longer, with a length to width ratio of at least 3 to 1.

y. Friable ACM: A term defined in 40 CFR 61, Subpart M and EPA 340/1-90/018 meaning any material which contains more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy (PLM), that when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. If the asbestos content is less than 10 percent, as determined by a method other than point counting by PLM, the asbestos content is verified by point counting using PLM.

z. Glovebag: Not more than a 60 by 60 inch impervious plastic bag-like enclosure affixed around an asbestos-containing material, with glove-like appendages through which material and tools may be handled.

aa. High-Efficiency Particulate Air (HEPA) Filter: A filter capable of trapping and retaining at least 99.97 percent of all mono-dispersed particles of 0.3 micrometers in diameter.

bb. Homogeneous Area: An area of surfacing material or thermal system insulation that is uniform in color and texture.

cc. Industrial Hygienist: A professional qualified by education, training, and experience to anticipate, recognize, evaluate, and develop controls for occupational health hazards.

dd. Intact: ACM which has not crumbled, been pulverized, or otherwise deteriorated so that the asbestos is no longer likely to be bound with its matrix. Removal of "intact" asphaltic, resinous, cementitious products does not render the ACM non-intact simply by being separated into smaller pieces.

ee. Model Accreditation Plan (MAP): USEPA training accreditation requirements for persons who work with asbestos as specified in 40 CFR 763, Subpart E, Appendix C.

ff. Modification: A changed or altered procedure, material or component of a control system, which replaces a procedure, material or component of a required system.

gg. Negative Exposure Assessment: A demonstration by the Contractor to show that employee exposure during an operation is expected to be consistently below the OSHA Permissible Exposure Limits (PELs).

hh. NESHAP: National Emission Standards for Hazardous Air Pollutants. The USEPA NESHAP regulation for asbestos is at 40 CFR 61, Subpart M.

ii. Nonfriable ACM: A NESHAP term defined in 40 CFR 61, Subpart M

and EPA 340/1-90/018 meaning any material containing more than 1 percent asbestos, as determined using the method specified in 40 CFR 763, Subpart E, Appendix A, Section 1, Polarized Light Microscopy, that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

jj. Nonfriable ACM (Category I): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning asbestos-containing packings, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos as determined using the method specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy.

kk. Nonfriable ACM (Category II): A NESHAP term defined in 40 CFR 61, Subpart E and EPA 340/1-90/018 meaning any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos, as determined using the methods specified in 40 CFR 763, Subpart F, Appendix A, Section 1, Polarized Light Microscopy, that when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure.

ll. Permissible Exposure Limits (PELs):

(1) PEL-Time weighted average(TWA): Concentration of asbestos not in excess of 0.1 fibers per cubic centimeter of air (f/cc) as an 8 hour time weighted average (TWA), as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.

(2) PEL-Excursion Limit: An airborne concentration of asbestos not in excess of 1.0 f/cc of air as averaged over a sampling period of 30 minutes as determined by the method prescribed in 29 CFR 1926, Section .1101, Appendix A, or the current version of NIOSH Pub No. 84-100 analytical method 7400.

mm. Regulated Area: An OSHA term defined in 29 CFR 1926, Section .1101 meaning an area established by the Contractor to demarcate areas where Class I, II, and III asbestos work is conducted; also any adjoining area where debris and waste from such asbestos work accumulate; and an area within which airborne concentrations of asbestos exceed, or there is a reasonable possibility they may exceed, the permissible exposure limit.

nn. Removal: All operations where ACM is taken out or stripped from structures or substrates, and includes demolition operations.

oo. Repair: Overhauling, rebuilding, reconstructing, or reconditioning of structures or substrates, including encapsulation or other repair of ACM attached to structures or substrates. If the amount of asbestos so "disturbed" cannot be contained in 1 standard glovebag or waste bag, Class I precautions are required.

pp. Spills/Emergency Cleanups: Cleanup of sizable amounts of asbestos waste and debris which has occurred, for example, when water damage occurs in a building, and sizable amounts of ACM are dislodged. A Competent Person evaluates the site and ACM to be handled, and based on the type, condition and extent of the dislodged material, classifies the cleanup as Class I, II, or III.

Only if the material was intact and the cleanup involves mere contact of ACM, rather than disturbance, could there be a Class IV classification.

qq. Surfacing ACM: Asbestos-containing material which contains more than 1% asbestos and is sprayed-on, troweled-on, or otherwise applied to surfaces, such as acoustical plaster on ceilings and fireproofing materials on structural members, or other materials on surfaces for acoustical, fireproofing, or other purposes.

rr. Thermal system insulation (TSI) ACM: ACM which contains more than 1% asbestos and is applied to pipes, fittings, boilers, breeching, tanks, ducts, or other interior structural components to prevent heat loss or gain or water condensation.

ss. Transite: A generic name for asbestos cement wallboard and pipe.

tt. Worker: Individual (not designated as the Competent Person or a supervisor) who performs asbestos work and has completed asbestos worker training required by 29 CFR 1926, Section .1101, to include EPA Model Accreditation Plan (MAP) "Worker" training; accreditation required by 40 CFR 763, Subpart E, Appendix C, if required by the OSHA Class of work to be performed or by the state where the work is to be performed.

## 1.3 DESCRIPTION OF WORK

The work covered by this section includes the removal of asbestos-containing materials (ACM) which are encountered during demolition for the renovation activities associated with this project and describes procedures and equipment required to protect workers and occupants of the regulated area from contact with airborne asbestos fibers and ACM dust and debris. Activities include OSHA Class II work operations involving ACM. The work also includes containment, storage, transportation and disposal of the generated ACM wastes. More specific operational procedures shall be detailed in the required Accident Prevention Plan and its subcomponents, the Asbestos Hazard Abatement Plan and Activity Hazard Analyses required in paragraph SAFETY AND HEALTH PROGRAM AND PLANS.

### 1.3.1 Abatement Work Tasks

The specific ACM to be abated is identified on the detailed plans and project drawings. A summary of work task data elements for each individual ACM abatement work task to include the appropriate RESPONSE ACTION DETAIL SHEET (item to be abated and methods to be used) and SET-UP DETAIL SHEETS (containment techniques to include safety precautions and methods) is included in Table 1, "Individual Work Task Data Elements" at the end of this section.

### 1.3.2 Unexpected Discovery of Asbestos

For any previously untested building components suspected to contain asbestos and located in areas impacted by the work, the Contractor shall notify the Contracting Officer (CO) who will have the option of ordering up to 10 bulk samples to be obtained at the Contractor's expense and delivered to a laboratory accredited under the National Institute of Standards and Technology (NIST) "National Voluntary Laboratory Accreditation Program (NVLAP)" and analyzed by PLM at no additional cost to the Government. Any additional components identified as ACM that have been approved by the

Contracting Officer for removal shall be removed by the Contractor and will be paid for by an equitable adjustment to the contract price under the CONTRACT CLAUSE titled "changes". Sampling activities undertaken to determine the presence of additional ACM shall be conducted by personnel who have successfully completed the EPA Model Accreditation Plan (MAP) "Building Inspector" training course required by 40 CFR 763, Subpart E, Appendix C.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Respiratory Protection Program

Records of the respirator program.

Cleanup and Disposal

Waste shipment records. Weigh bills and delivery tickets shall be furnished for information only.

Detailed Drawings

Descriptions, detail project drawings, and site layout to include worksite containment area techniques as prescribed on applicable SET-UP DETAIL SHEETS, local exhaust ventilation system locations, decontamination units and load-out units, other temporary waste storage facility, access tunnels, location of temporary utilities (electrical, water, sewer) and boundaries of each regulated area.

Materials and Equipment

Manufacturer's catalog data for all materials and equipment to be used in the work, including brand name, model, capacity, performance characteristics and any other pertinent information. Test results and certificates from the manufacturer of encapsulants substantiating compliance with performance requirements of this specification. Material Safety Data Sheets for all chemicals to be used onsite in the same format as implemented in the Contractor's HAZARD COMMUNICATION PROGRAM. Data shall include, but shall not be limited to, the following items:

a. High Efficiency Filtered Air (HEPA) local exhaust equipment

b. Vacuum cleaning equipment

c. Pressure differential monitor for HEPA local exhaust equipment

d. Air monitoring equipment

e. Respirators

f. Personal protective clothing and equipment

(1) Coveralls
(2) Foot coverings
(3) Hard hats
(4) Eye protection
(5) Other items required and approved by Contractors Designated IH and Competent Person

g. Duct Tape

h. Disposal Containers

(1) Disposal bags

i. Sheet Plastic

(1) Polyethylene Sheet - General

j. Wetting Agent

(1) Amended Water
(2) Removal encapsulant

k. Prefabricated Decontamination Unit

l. Other items

m. Material Safety Data Sheets (for all chemicals proposed)

Qualifications; G

A written report providing evidence of qualifications for personnel, facilities and equipment assigned to the work.

Training Program

A copy of the written project site-specific training material as indicated in 29 CFR 1926, Section .1101 that will be used to train onsite employees. The training document shall be signed by the Contractor's Designated IH and Competent Person.

Medical Requirements

Physician's written opinion.

Encapsulants

Certificates stating that encapsulants meet the applicable specified performance requirements.

SD-06 Test Reports

Exposure Assessment and Air Monitoring

Initial exposure assessments, negative exposure assessments,

air-monitoring results and documentation.

Local Exhaust Ventilation

Pressure differential recordings.

Licenses, Permits and Notifications

Licenses, permits, and notifications.

SD-07 Certificates

Vacuum, Filtrationand Ventilation Equipment
Manufacturer's certifications showing compliance with ANSI Z9.2 for:

a. Vacuums.

b. Water filtration equipment.

c. Ventilation equipment.

d. Other equipment required to contain airborne asbestos fibers.

## 1.5 QUALIFICATIONS

### 1.5.1 Written Qualifications and Organization Report

The Contractor shall furnish a written qualifications and organization report providing evidence of qualifications of the Contractor, Contractor's Project Supervisor, Designated Competent Person, supervisors and workers; Designated IH (person assigned to project and firm name); independent testing laboratory (including name of firm, principal, and analysts who will perform analyses); all subcontractors to be used including disposal transportation and disposal facility firms, subcontractor supervisors, subcontractor workers; and any others assigned to perform asbestos abatement and support activities. The report shall include an organization chart showing the Contractor's staff organization for this project by name and title, chain of command and reporting relationship with all subcontractors. The report shall be signed by the Contractor, the Contractor's onsite project manager, Designated Competent Person, Designated IH, designated testing laboratory and the principals of all subcontractors to be used. The Contractor shall include the following statement in the report: "By signing this report I certify that the personnel I am responsible for during the course of this project fully understand the contents of 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and the federal, state and local requirements specified in paragraph SAFETY AND HEALTH PROGRAM AND PLANS for those asbestos abatement activities that they will be involved in."

### 1.5.2 Specific Requirements

The Contractor shall designate in writing, personnel meeting the following qualifications:

a. Designated Competent Person: The name, address, telephone number, and resume of the Contractor's Designated Competent Person shall be provided. Evidence that the full-time Designated Competent Person is qualified in accordance with 29 CFR 1926, Sections .32

and .1101, has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and HAR Chapter 504 and is experienced in the administration and supervision of asbestos abatement projects, including exposure assessment and monitoring, work practices, abatement methods, protective measures for personnel, setting up and inspecting asbestos abatement work areas, evaluating the integrity of containment barriers, placement and operation of local exhaust systems, ACM generated waste containment and disposal procedures, decontamination units installation and maintenance requirements, site safety and health requirements, notification of other employees onsite, etc. The duties of the Competent Person shall include the following: controlling entry to and exit from the regulated area; supervising any employee exposure monitoring required by 29 CFR 1926, Section .1101; ensuring that all employees working within a regulated area wear the appropriate personal protective equipment (PPE), are trained in the use of appropriate methods of exposure control, and use the hygiene facilities and decontamination procedures specified; and ensuring that engineering controls in use are in proper operating conditions and are functioning properly. The Designated Competent Person shall be responsible for compliance with applicable federal, state and local requirements, the Contractor's Accident Prevention Plan and Asbestos Hazard Abatement Plan. The Designated Competent Person shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that this person has a minimum of 2 years of on-the-job asbestos abatement experience relevant to OSHA competent person requirements. The Designated Competent Person shall be onsite at all times during the conduct of this project.

b. Project and Other Supervisors: The Contractor shall provide the name, address, telephone number, and resume of the Project Supervisor and other supervisors who have responsibility to implement the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses, the authority to direct work performed under this contract and verify compliance, and have EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C. The Project Supervisor and other supervisors shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Contractor shall submit evidence that the Project Supervisor has a minimum of 2 years of on-the-job asbestos abatement experience relevant to project supervisor responsibilities and the other supervisors have a minimum of 2 years on-the-job asbestos abatement experience commensurate with the responsibilities they will have on this project.

c. Designated Industrial Hygienist: The Contractor shall provide the name, address, telephone number, resume and other information specified below for the Industrial Hygienist (IH) selected to prepare the Contractor's Asbestos Hazard Abatement Plan, prepare and perform training, direct air monitoring and assist the

Contractor's Competent Person in implementing and ensuring that safety and health requirements are complied with during the performance of all required work. The Designated IH shall be a person who is board eligible (meets all education and experience requirements) as determined and documented by the American Board of Industrial Hygiene (ABIH), has EPA Model Accreditation Plan (MAP) "Contractor/Supervisor" training accreditation required by 40 CFR 763, Subpart E, Appendix C, and has a minimum of 2 years of comprehensive experience in planning and overseeing asbestos abatement activities. The Designated IH shall provide, and the Contractor shall submit, the "Contractor/Supervisor" course completion certificate and the most recent certificate for required refresher training with the employee "Certificate of Worker Acknowledgment" required by this paragraph. The Designated IH shall be completely independent from the Contractor according to federal, state, or local regulations; that is, shall not be a Contractor's employee or be an employee or principal of a firm in a business relationship with the Contractor negating such independent status. A copy of the Designated IH's current educational Diplomas, valid ABIH confirmation of eligibility in writing from the ABIH shall be included. The Designated IH shall be onsite at all times, visit the site at least 1 per week for the duration of asbestos activities and shall be available for emergencies. In addition, the Designated IH shall prepare, and the Contractor shall submit, the name, address, telephone numbers and resumes of additional IH's and industrial hygiene technicians (IHT) who will be assisting the Designated IH in performing onsite tasks. IHs and IHTs supporting the Designated IH shall have a minimum of 2 years of practical onsite asbestos abatement experience. The formal reporting relationship between the Designated IH and the support IHs and IHTs, the Designated Competent Person, and the Contractor shall be indicated.

d. Asbestos Abatement Workers: Asbestos abatement workers shall meet the requirements contained in 29 CFR 1926, Section .1101, 40 CFR 61, Subpart M, and other applicable federal, state HAR Chapter 501, HAR Chapter 502, HAR Chapter 503, HAR Chapter 504 and local requirements. Worker training documentation shall be provided as required on the "Certificate of Workers Acknowledgment" in this paragraph.

e. Worker Training and Certification of Worker Acknowledgment: Training documentation will be required for each employee who will perform OSHA Class I, Class II, Class III, or Class IV asbestos abatement operations. Such documentation shall be submitted on a Contractor generated form titled "Certificate of Workers Acknowledgment", to be completed for each employee in the same format and containing the same information as the example certificate at the end of this section. Training course completion certificates (initial and most recent update refresher) required by the information checked on the form shall be attached.

f. Physician: The Contractor shall provide the name, medical qualifications, address, telephone number and resume of the physician who will or has performed the medical examinations and evaluations of the persons who will conduct the asbestos abatement work tasks. The physician shall be currently licensed by the state where the workers will be or have been examined, have expertise in pneumoconiosis and shall be responsible for the

determination of medical surveillance protocols and for review of examination/test results performed in compliance with 29 CFR 1926, Section .1101 and paragraph MEDICAL REQUIREMENTS. The physician shall be familiar with the site's hazards and the scope of this project.

g. First Aid and CPR Trained Persons: The names of at least 2 persons who are currently trained in first aid and CPR by the American Red Cross or other approved agency shall be designated and shall be onsite at all times during site operations preferably the forman. They shall be trained in universal precautions and the use of PPE as described in the Bloodborne Pathogens Standard of 29 CFR 1910, Section .1030 and shall be included in the Contractor's Bloodborne Pathogen Program. These persons may perform other duties but shall be immediately available to render first aid when needed. A copy of each designated person's current valid First Aid and CPR certificate shall be provided.

h. Independent Testing Laboratory: The Contractor shall provide the name, address and telephone number of the independent testing laboratory selected to perform the sample analyses and report the results. The testing laboratory shall be registered with the State of Hawaii Department of Health completely independent from the Contractor as recognized by federal, state or local regulations. Written verification of the following criteria, signed by the testing laboratory principal and the Contractor, shall be submitted:

(1) Phase contrast microscopy (PCM): The laboratory is fully equipped and proficient in conducting PCM of airborne samples using the methods specified by 29 CFR 1926, Section .1101, OSHA method ID-160, the most current version of NIOSH Pub No. 84-100 Method 7400; the laboratory is currently judged proficient (classified as acceptable) in counting airborne asbestos samples by PCM by successful participation in each of the last 4 rounds in the American Industrial Hygiene Association (AIHA) Proficiency Analytical Testing (PAT) Program; the names of the selected microscopists who will analyze airborne samples by PCM with verified documentation of their proficiency to conduct PCM analyses by being judged proficient in counting samples as current participating analysts in the AIHA PAT Program, and having successfully completed the Asbestos Sampling and Analysis course (NIOSH 582 or equivalent) with a copy of course completion certificate provided; when the PCM analysis is to be conducted onsite, documentation shall be provided certifying that the onsite analyst meets the same requirements.

(2) Polarized light microscopy (PLM): The laboratory is fully equipped and proficient in conducting PLM analyses of suspect ACM bulk samples in accordance with 40 CFR 763, Subpart E, Appendix E; the laboratory is currently accredited by NIST under the NVLAP for bulk asbestos analysis and will use analysts (names shall be provided) with demonstrated proficiency to conduct PLM to include its application to the identification and quantification of asbestos content.

(3) PCM: The laboratory is fully equipped and each analyst (name shall be provided) possesses demonstrated proficiency in conducting PCM analysis of airborne samples using NIOSH Pub No.

84-100Method 7400 PCM.

i. Disposal Facility, Transporter: The Contractor shall provide written evidence that the landfill to be used is approved for asbestos disposal by the USEPA and state and local regulatory agencies. Copies of signed agreements between the Contractor (including subcontractors and transporters) and the asbestos waste disposal facility to accept and dispose of all asbestos containing waste generated during the performance of this contract shall be provided. Qualifications shall be provided for each subcontractor or transporter to be used, indicating previous experience in transport and disposal of asbestos waste to include all required state and local waste hauler requirements for asbestos. The Contractor and transporters shall meet the DOT requirements of 49 CFR 171, 49 CFR 172, and 49 CFR 173 as well as registration requirements of 49 CFR 107 and other applicable state or local requirements. The disposal facility shall meet the requirements of 40 CFR 61, Sections .154 or .155, as required in 40 CFR 61, Section .150(b), and other applicable state or local requirements.

### 1.5.3 Federal, State or Local Citations on Previous Projects

The Contractor and all subcontractors shall submit a statement, signed by an officer of the company, containing a record of any citations issued by Federal, State or local regulatory agencies relating to asbestos activities (including projects, dates, and resolutions); a list of penalties incurred through non-compliance with asbestos project specifications, including liquidated damages, overruns in scheduled time limitations and resolutions; and situations in which an asbestos-related contract has been terminated (including projects, dates, and reasons for terminations). If there are none, a negative declaration signed by an officer of the company shall be provided.

## 1.6 REGULATORY REQUIREMENTS

In addition to detailed requirements of this specification, work performed under this contract shall comply with EM 385-1-1, applicable federal, state, and local laws, ordinances, criteria, rules and regulations regarding handling, storing, transporting, and disposing of asbestos waste materials. This includes, but is not limited to, OSHA standards, 29 CFR 1926, especially Section .1101, 40 CFR 61, Subpart M and 40 CFR 763. Matters of interpretation of standards shall be submitted to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply. The following state and local laws, rules and regulations regarding demolition, removal, encapsulation, construction alteration, repair, maintenance, renovation, spill/emergency cleanup, housekeeping, handling, storing, transporting and disposing of asbestos material apply: HIOSH 12-145 and HAR Chapter 501, HAR Chapter 502, HAR Chapter 503, HAR Chapter 504.

## 1.7 SAFETY AND HEALTH PROGRAM AND PLANS

The Contractor shall develop and submit a written comprehensive site-specific Accident Prevention Plan at least 30 days prior to the preconstruction conference. The Accident Prevention Plan shall address requirements of EM 385-1-1, Appendix A, covering onsite work to be performed by the Contractor and subcontractors. The Accident Prevention

Plan shall incorporate an Asbestos Hazard Abatement Plan, and Activity Hazard Analyses as separate appendices into 1 site specific Accident Prevention Plan document. Any portions of the Contractor's overall Safety and Health Program that are referenced in the Accident Prevention Plan, e.g., respirator program, hazard communication program, confined space entry program, etc., shall be included as appendices to the Accident Prevention Plan. The plan shall take into consideration all the individual asbestos abatement work tasks identified in Table 1. The plan shall be prepared, signed (and sealed, including certification number if required), and dated by the Contractor's Designated IH, Competent Person, and Project Supervisor.

1.7.1 Asbestos Hazard Abatement Plan Appendix

The Asbestos Hazard Abatement Plan appendix to the Accident Prevention Plan shall include, but not be limited to, the following:

a. The personal protective equipment to be used;

b. The location and description of regulated areas including clean and dirty areas,access tunnels, and decontamination unit (clean room, shower room, equipment room, storage areas such as load-out unit);

c. Initial exposure assessment in accordance with 29 CFR 1926, Section .1101;

d. Level of supervision;

e. Method of notification of other employers at the worksite;

f. Abatement method to include containment and control procedures;

g. Interface of trades involved in the construction;

h. Sequencing of asbestos related work;

i. Storage and disposal procedures and plan;

j. Type of wetting agent and asbestos encapsulant to be used;

k. Location of local exhaust equipment;

l. Air monitoring methods (personal, environmental and clearance);

m. Bulk sampling and analytical methods (if required);

n. A detailed description of the method to be employed in order to control the spread of ACM wastes and airborne fiber concentrations;

o. Fire and medical emergency response procedures;

p. The security procedures to be used for all regulated areas.

1.7.2 Activity Hazard Analyses Appendix

Activity Hazard Analyses, for each major phase of work, shall be submitted and updated during the project. The Activity Hazard Analyses format shall be in accordance with EM 385-1-1 (Figure 1-1). The analysis shall define

the activities to be performed for a major phase of work, identify the sequence of work, the specific hazards anticipated, and the control measures to be implemented to eliminate or reduce each hazard to an acceptable level. Work shall not proceed on that phase until the Activity Hazard Analyses has been accepted and a preparatory meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activities, including the onsite Government representatives. The Activity Hazard Analyses shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations.

## 1.8 PRECONSTRUCTION CONFERENCE AND ONSITE SAFETY

The Contractor and the Contractor's Designated Competent Person, Project Supervisor, and Designated IH shall meet with the Contracting Officer prior to beginning work at a safety preconstruction conference to discuss the details of the Contractor's submitted Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses appendices. Deficiencies in the Accident Prevention Plan will be discussed and the Accident Prevention Plan shall be revised to correct the deficiencies and resubmitted for acceptance. Any changes required in the specification as a result of the Accident Prevention Plan shall be identified specifically in the plan to allow for free discussion and acceptance by the Contracting Officer, prior to the start of work. Onsite work shall not begin until the Accident Prevention Plan has been accepted. A copy of the written Accident Prevention Plan shall be maintained onsite. Changes and modifications to the accepted Accident Prevention Plan shall be made with the knowledge and concurrence of the Designated IH, the Project Supervisor, Designated Competent Person, and the Contracting Officer. Should any unforeseen hazard become evident during the performance of the work, the Designated IH shall bring such hazard to the attention of the Project Supervisor, Designated Competent Person, and the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment. Once accepted by the Contracting Officer, the Accident Prevention Plan, including the Asbestos Hazard Abatement Plan and Activity Hazard Analyses will be enforced as if an addition to the contract. Disregarding the provisions of this contract or the accepted Accident Prevention Plan will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

## 1.9 SECURITY

The Contractor shall have sole control over entry and exit from worksite of each regulated area. A log book shall be kept documenting entry into and out of the regulated area. Entry into regulated areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Personnel authorized to enter regulated areas shall be trained, be medically evaluated, and wear the required personal protective equipment for the specific regulated area to be entered.

## 1.10 MEDICAL REQUIREMENTS

Medical requirements shall conform to 29 CFR 1926, Section .1101.

### 1.10.1 Medical Examinations

Before being exposed to airborne asbestos fibers, workers shall be provided with a medical examination as required by 29 CFR 1926, Section .1101 and

other pertinent state or local requirements. This requirement shall have been satisfied within the last 12 months. The same medical examination shall be given on an annual basis to employees engaged in an occupation involving asbestos and within 30 calendar days before or after the termination of employment in such occupation. X-ray films of asbestos workers shall be identified to the consulting radiologist and medical record jackets shall be marked with the word "asbestos."

1.10.1.1 Information Provided to the Physician

The Contractor shall provide the following information in writing to the examining physician:

a. A copy of 29 CFR 1926, Section .1101 and Appendices D, E, G, and I;

b. A description of the affected employee's duties as they relate to the employee's exposure;

c. The employee's representative exposure level or anticipated exposure level;

d. A description of any personal protective and respiratory equipment used or to be used;

e. Information from previous medical examinations of the affected employee that is not otherwise available to the examining physician.

1.10.1.2 Written Medical Opinion

For each worker, a written medical opinion prepared and signed by a licensed physician indicating the following:

a. Summary of the results of the examination.

b. The potential for an existing physiological condition that would place the employee at an increased risk of health impairment from exposure to asbestos.

c. The ability of the individual to wear personal protective equipment, including respirators, while performing strenuous work tasks under cold and/or heat stress conditions.

d. A statement that the employee has been informed of the results of the examination, provided with a copy of the results, informed of the increased risk of lung cancer attributable to the combined effect of smoking and asbestos exposure, and informed of any medical condition that may result from asbestos exposure.

1.10.2 Medical and Exposure Records

Complete and accurate records shall be maintained of each employee's medical examinations, medical records, and exposure data, as required by 29 CFR 1910, Section .1910.20 and 29 CFR 1926, Section .1101 for a period of 50 years after termination of employment. Records of the required medical examinations and exposure data shall be made available, for inspection and copying, to the Assistant Secretary of Labor for Occupational Safety and Health (OSHA) or authorized representatives of the employee and an employee's physician upon request of the employee or former employee. A

copy of the required medical certification for each employee shall be maintained on file at the worksite for review, as requested by the Contracting Officer or the representatives.

## 1.11 TRAINING PROGRAM

### 1.11.1 General Training Requirements

The Contractor shall establish a training program as specified by EPA Model Accreditation Plan (MAP), training requirements at 40 CFR 763, Subpart E, Appendix C, the State of Hawaii, HAR Chapter 501, HAR Chapter 502, HAR Chapter 503, HAR Chapter 504, OSHA requirements at 29 CFR 1926, Section .1101(k)(9), and this specification. Contractor employees shall complete the required training for the type of work they are to perform and such training shall be documented and provided to the Contracting Officer as specified in paragraph QUALIFICATIONS.

### 1.11.2 Project Specific Training

Prior to commencement of work, each worker shall be instructed by the Contractor's Designated IH and Competent Person in the following project specific training:

a. The hazards and health effects of the specific types of ACM to be abated;

b. The content and requirements of the Contractor's Accident Prevention Plan to include the Asbestos Hazard Abatement Plan and Activity Hazard Analyses and site-specific safety and health precautions;

c. Hazard Communication Program;

d. Hands-on training for each asbestos abatement technique to be employed;

e. Heat stress monitoring specific to this project;

f. Air monitoring program and procedures;

g. Medical surveillance to include medical and exposure record-keeping procedures;

h. The association of cigarette smoke and asbestos-related disease;

i. Security procedures;

j. Specific work practice controls and engineering controls required for each Class of work in accordance with 29 CFR 1926, Section .1101.

## 1.12 RESPIRATORY PROTECTION PROGRAM

The Contractor's Designated IH shall establish in writing, and implement a respiratory protection program in accordance with 29 CFR 1926, Section .1101, 29 CFR 1910, Section .134, ANSI Z88.2, CGA G-7, CGA G-7.1 and DETAIL SHEET 12. The Contractor's Designated IH shall establish minimum respiratory protection requirements based on measured or anticipated levels of airborne asbestos fiber concentrations encountered during the performance of the asbestos abatement work. The Contractor's respiratory protection program

shall include, but not be limited to, the following elements:

a. The company policy, used for the assignment of individual responsibility, accountability, and implementation of the respiratory protection program.

b. The standard operating procedures covering the selection and use of respirators. Respiratory selection shall be determined by the hazard to which the worker is exposed.

c. Medical evaluation of each user to verify that the worker may be assigned to an activity where respiratory protection is required.

d. Training in the proper use and limitations of respirators.

e. Respirator fit-testing, i.e., quantitative, qualitative and individual functional fit checks.

f. Regular cleaning and disinfection of respirators.

g. Routine inspection of respirators during cleaning and after each use when designated for emergency use.

h. Storage of respirators in convenient, clean, and sanitary locations.

i. Surveillance of regulated area conditions and degree of employee exposure (e.g., through air monitoring).

j. Regular evaluation of the continued effectiveness of the respiratory protection program.

k. Recognition and procedures for the resolution of special problems as they affect respirator use (e.g., no facial hair that comes between the respirator face piece and face or interferes with valve function; prescription eye wear usage; contact lenses usage; etc.).

l. Proper training in putting on and removing respirators.

1.12.1 Respiratory Fit Testing

A qualitative or quantitative fit test conforming to 29 CFR 1926, Section 1101, Appendix C shall be conducted by the Contractor's Designated IH for each Contractor worker required to wear a respirator, and for the Contracting Officer and authorized visitors who enter a regulated area where respirators are required to be worn. A respirator fit test shall be performed for each worker wearing a negative-pressure respirator prior to initially wearing a respirator on this project and every 6 months thereafter. The qualitative fit tests may be used only for testing the fit of half-mask respirators where they are permitted to be worn, or of full-facepiece air purifying respirators where they are worn at levels at which half-facepiece air purifying respirators are permitted. If physical changes develop that will affect the fit, a new fit test for the worker shall be performed. Functional fit checks shall be performed by employees each time a respirator is put on and in accordance with the manufacturer's recommendation.

1.12.2 Respirator Selection and Use Requirements

The Contractor shall provide respirators, and ensure that they are used as required by 29 CFR 1926, Section .1101 and in accordance with the manufacturer's recommendations. Respirators shall be jointly approved by the Mine Safety and Health Administration and the National Institute for Occupational Safety and Health (MSHA/NIOSH), or by NIOSH, under the provisions of 42 CFR 84, for use in environments containing airborne asbestos fibers. Personnel who handle ACM, enter regulated areas that require the wearing of a respirator, or who are otherwise carrying out abatement activities that require the wearing of a respirator, shall be provided with approved respirators that are fully protective of the worker at the measured or anticipated airborne asbestos concentration level to be encountered. For air-purifying respirators, the particulate filter portion of the cartridges or canister approved for use in airborne asbestos environments shall be high-efficiency particulate air (HEPA). The initial respirator selection and the decisions regarding the upgrading or downgrading of respirator type shall be made by the Contractor's Designated IH based on the measured or anticipated airborne asbestos fiber concentrations to be encountered. Recommendations made by the Contractor's Designated IH to downgrade respirator type shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person in consultation with the Designated IH, shall have the authority to take immediate action to upgrade or downgrade respiratory type when there is an immediate danger to the health and safety of the wearer. Respirators shall be used in the following circumstances:

a. During all Class II work where the ACM is not removed in a substantially intact state.

b. During all Class II and III work which is not performed using wet methods. Respirators need not be worn during removal of ACM from sloped roofs when a negative exposure assessment has been made and ACM is removed in an intact state.

c. During all Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment.

d. In emergencies

1.12.3 Class II and III Work

The Contractor shall provide an air purifying respirator, other than a disposable respirator, equipped with high-efficiency filters whenever the employee performs Class II and III asbestos jobs where the Contractor does not produce a negative exposure assessment ; and Class III jobs where TSI or surfacing ACM is being disturbed.

1.12.4 Sanitation

Employees who wear respirators shall be permitted to leave work areas to wash their faces and respirator facepieces whenever necessary to prevent skin irritation associated with respirator use.

1.13 HAZARD COMMUNICATION PROGRAM

A hazard communication program shall be established and implemented in accordance with 29 CFR 1926, Section .59. Material safety data sheets (MSDSs) shall be provided for all hazardous materials brought onto the worksite. One copy shall be provided to the Contracting Officer and 1 copy

shall be included in the Contractor's Hazard Communication Program.

## 1.14 LICENSES, PERMITS AND NOTIFICATIONS

### 1.14.1 General Legal Requirements

Necessary licenses, permits and notifications shall be obtained in conjunction with the project's asbestos abatement, transportation and disposal actions and timely notification furnished of such actions as required by federal, state, regional, and local authorities. The Contractor shall notify the Regional Office of the USEPA state's environmental protection agency responsible for asbestos air emissions and the Contracting Officer in writing, at least 10 days prior to the commencement of work, in accordance with 40 CFR 61, Subpart M, and state and local requirements to include the mandatory "Notification of Demolition and Renovation Record" form and other required notification documents. Notification shall be by Certified Mail, Return Receipt Requested. The Contractor shall furnish copies of the receipts to the Contracting Officer, in writing, prior to the commencement of work. Local fire department shall be notified 3 days before fire-proofing material is removed from a building and the notice shall specify whether or not the material contains asbestos. A copy of the rental company's written acknowledgment and agreement shall be provided as required by paragraph RENTAL EQUIPMENT. For licenses, permits, and notifications that the Contractor is responsible for obtaining, the Contractor shall pay any associated fees or other costs incurred.

### 1.14.2 Litigation and Notification

The Contractor shall notify the Contracting Officer if any of the following occur:

a. The Contractor or any of the subcontractors are served with notice of violation of any law, regulation, permit or license which relates to this contract;

b. Proceedings are commenced which could lead to revocation of related permits or licenses; permits, licenses or other Government authorizations relating to this contract are revoked;

c. Litigation is commenced which would affect this contract;

d. The Contractor or any of the subcontractors become aware that their equipment or facilities are not in compliance or may fail to comply in the future with applicable laws or regulations.

## 1.15 PERSONAL PROTECTIVE EQUIPMENT

Three complete sets of personal protective equipment shall be made available to the Contracting Officer and authorized visitors for entry to the regulated area. Contracting Officer and authorized visitors shall be provided with training equivalent to that provided to Contractor employees in the selection, fitting, and use of the required personal protective equipment and the site safety and health requirements. Contractor workers shall be provided with personal protective clothing and equipment and the Contractor shall ensure that it is worn properly. The Contractor's Designated IH and Designated Competent Person shall select and approve all the required personal protective clothing and equipment to be used.

1.15.1 Respirators

Respirators shall be in accordance with paragraph RESPIRATORY PROTECTION PROGRAM.

1.15.2 Whole Body Protection

Personnel exposed to airborne concentrations of asbestos that exceed the PELs, or for all OSHA Classes of work for which a required negative exposure assessment is not produced, shall be provided with whole body protection and such protection shall be worn properly. The Contractor's Designated IH and Competent Person shall select and approve the whole body protection to be used. The Competent Person shall examine work suits worn by employees at least once per work shift for rips or tears that may occur during performance of work. When rips or tears are detected while an employee is working, rips and tears shall be immediately mended, or the work suit shall be immediately replaced. Disposable whole body protection shall be disposed of as asbestos contaminated waste upon exiting from the regulated area. Reusable whole body protection worn shall be either disposed of as asbestos contaminated waste upon exiting from the regulated area or be properly laundered in accordance with 29 CFR 1926, Section .1101. Whole body protection used for asbestos abatement shall not be removed from the worksite by a worker to be cleaned. Recommendations made by the Contractor's Designated IH to downgrade whole body protection shall be submitted in writing to the Contracting Officer. The Contractor's Designated Competent Person, in consultation with the Designated IH, has the authority to take immediate action to upgrade or downgrade whole body protection when there is an immediate danger to the health and safety of the wearer.

1.15.2.1 Coveralls

Disposable-breathable coveralls with a zipper front shall be provided. Sleeves shall be secured at the wrists, and foot coverings secured at the ankles. See DETAIL SHEET 13.

1.15.2.2 Work Clothing

An additional coverall shall be provided when the abatement and control method employed does not provide for the exit from the regulated area directly into an attached decontamination unit. Cloth work clothes for wear under the protective coverall, and foot coverings, shall be provided when work is being conducted in low temperature conditions.

1.15.2.3 Gloves

Gloves shall be provided to protect the hands. Where there is the potential for hand injuries (i.e., scrapes, punctures, cuts, etc.) a suitable glove shall be provided and used.

1.15.2.4 Foot Coverings

Cloth socks shall be provided and worn next to the skin. Footwear, as required by OSHA and EM 385-1-1, that is appropriate for safety and health hazards in the area shall be worn. Rubber boots shall be used in moist or wet areas. Reusable footwear removed from the regulated area shall be thoroughly decontaminated or disposed of as ACM waste. Disposable protective foot covering shall be disposed of as ACM waste. If rubber boots are not used, disposable foot covering shall be provided.

1.15.2.5 Head Covering

Hood type disposable head covering shall be provided. In addition, protective head gear (hard hats) shall be provided as required. Hard hats shall only be removed from the regulated area after being thoroughly decontaminated.

1.15.2.6 Protective Eye Wear

Eye protection provided shall be in accordance with ANSI Z87.1.

1.16 HYGIENE FACILITIES AND PRACTICES

The Contractor shall establish a decontamination area for the decontamination of employees, material and equipment. The Contractor shall ensure that employees enter and exit the regulated area through the decontamination area.

1.16.1 Shower Facilities

Shower facilities, when provided, shall comply with 29 CFR 1910, Section .141(d)(3).

1.16.2 3-Stage Decontamination Area

A temporary negative pressure decontamination unit that is adjacent and attached in a leak-tight manner to the regulated area shall be provided as described in SET-UP DETAIL SHEET Numbers 22 and 23. The decontamination unit shall have an equipment room and a clean room separated by a shower that complies with 29 CFR 1910, Section .141 (unless the Contractor can demonstrate that such facilities are not feasible). Equipment and surfaces of containers filled with ACM shall be cleaned prior to removing them from the equipment room or area. Surfaces of the equipment room shall be wet wiped 2 times after each shift. Materials used for wet wiping shall be disposed of as asbestos contaminated waste. Two separate lockers shall be provided for each asbestos worker, one in the equipment room and one in the clean room. Hot water service may be secured from the building hot water system provided backflow protection is installed by the Contractor at the point of connection. The wastewater pump shall be sized for 1.25 times the showerhead flow-rate at a pressure head sufficient to satisfy the filter head loss and discharge line losses. The pump shall supply a minimum 25 gpm flow with 35 ft. of pressure head. Used shower water shall be collected and filtered to remove asbestos contamination. Filters and residue shall be disposed of as asbestos contaminated material, per DETAIL SHEETS 9 and 14. Filtered water shall be discharged to the sanitary system. Wastewater filters shall be installed in series with the first stage pore size of 20 microns and the second stage pore size of 5 microns. The floor of the decontamination unit's clean room shall be kept dry and clean at all times. Water from the shower shall not be allowed to wet the floor in the clean room. Surfaces of the clean room and shower shall be wet-wiped 2 times after each shift change with a disinfectant solution. Proper housekeeping and hygiene requirements shall be maintained. Soap and towels shall be provided for showering, washing and drying. Any cloth towels provided shall be disposed of as ACM waste or shall be laundered in accordance with 29 CFR 1926, Section .1101.

1.16.3 Decontamination Area Entry Procedures

The Contractor shall ensure that employees entering the decontamination

area through the clean room or clean area:

a. Remove street clothing in the clean room or clean area and deposit it in lockers.

b. Put on protective clothing and respiratory protection before leaving the clean room or clean area.

c. Pass through the equipment room to enter the regulated area.

1.16.4 Decontamination Area Exit Procedures

The Contractor shall ensure that the following procedures are followed:

a. Before leaving the regulated area, respirators shall be worn while employees remove all gross contamination and debris from their work clothing using a HEPA vacuum.

b. Employees shall remove their protective clothing in the equipment room and deposit the clothing in labeled impermeable bags or containers (see Detail Sheets 9 and 14) for disposal and/or laundering.

c. Employees shall not remove their respirators in the equipment room.

d. Employees shall shower prior to entering the clean room. If a shower has not been located between the equipment room and the clean room or the work is performed outdoors, the Contractor shall ensure that employees engaged in Class I asbestos jobs: a) Remove asbestos contamination from their work suits in the equipment room or decontamination area using a HEPA vacuum before proceeding to a shower that is not adjacent to the work area; or b) Remove their contaminated work suits in the equipment room, without cleaning worksuits, and proceed to a shower that is not adjacent to the work area.

e. After showering, employees shall enter the clean room before changing into street clothes.

1.16.5 Lunch Areas

The Contractor shall provide lunch areas in which the airborne concentrations of asbestos are below 0.01 f/cc.

1.16.6 Smoking

Smoking, if allowed by the Contractor, shall only be permitted in designated areas approved by the Contracting Officer.

1.17 REGULATED AREAS

All Class I, II, and III asbestos work shall be conducted within regulated areas. The regulated area shall be demarcated to minimize the number of persons within the area and to protect persons outside the area from exposure to airborne asbestos. Where critical barriers or negative pressure enclosures are used, they shall demarcate the regulated area. Access to regulated areas shall be limited to authorized persons. The Contractor shall control access to regulated areas, ensure that only authorized personnel enter, and verify that Contractor required medical

surveillance, training and respiratory protection program requirements are met prior to allowing entrance.

1.18 WARNING SIGNS AND TAPE

Warning signs and tape printed in English shall be provided at the regulated boundaries and entrances to regulated areas. The Contractor shall ensure that all personnel working in areas contiguous to regulated areas comprehend the warning signs. Signs shall be located to allow personnel to read the signs and take the necessary protective steps required before entering the area. Warning signs, as shown and described in DETAIL SHEET 11, shall be in vertical format conforming to 29 CFR 1910 and 29 CFR 1926, Section .1101, a minimum of 20 by 14 inches, and displaying the following legend in the lower panel:

DANGER
ASBESTOS
CANCER AND LUNG DISEASE HAZARD
AUTHORIZED PERSONNEL ONLY
RESPIRATORS AND PROTECTIVE CLOTHING ARE REQUIRED IN THIS AREA

Spacing between lines shall be at least equal to the height of the upper of any two lines. Warning tape shall be provided as shown and described on DETAIL SHEET 11. Decontamination unit signage shall be as shown and described on DETAIL SHEET 15.

1.19 WARNING LABELS

Warning labels shall be affixed to all asbestos disposal containers used to contain asbestos materials, scrap, waste debris, and other products contaminated with asbestos. Containers with preprinted warning labels conforming to requirements are acceptable. Warning labels shall be as described in DETAIL SHEET 14, shall conform to 29 CFR 1926, Section .1101 and shall be of sufficient size to be clearly legible displaying the following legend:

DANGER
CONTAINS ASBESTOS FIBERS
AVOID CREATING DUST
CANCER AND LUNG DISEASE HAZARD

1.20 LOCAL EXHAUST VENTILATION

Local exhaust ventilation units shall conform to ANSI Z9.2 and 29 CFR 1926, Section .1101. Filters on local exhaust system equipment shall conform to ANSI Z9.2 and UL 586. Filter shall be UL labeled.

1.21 TOOLS

Vacuums shall be leak proof to the filter, equipped with HEPA filters, of sufficient capacity and necessary capture velocity at the nozzle or nozzle attachment to efficiently collect, transport and retain the ACM waste material. Power tools shall not be used to remove ACM unless the tool is equipped with effective, integral HEPA filtered exhaust ventilation capture and collection system, or has otherwise been approved for use by the Contracting Officer. Residual asbestos shall be removed from reusable tools prior to storage and reuse. Reusable tools shall be thoroughly decontaminated prior to being removed from regulated areas.

## 1.22 RENTAL EQUIPMENT

If rental equipment is to be used, written notification shall be provided to the rental agency, concerning the intended use of the equipment, the possibility of asbestos contamination of the equipment and the steps that will be taken to decontaminate such equipment. A written acceptance of the terms of the Contractor's notification shall be obtained from the rental agency.

## 1.23 AIR MONITORING EQUIPMENT

The Contractor's Designated IH shall approve air monitoring equipment to be used to collect samples. The equipment shall include, but shall not be limited to:

a. High-volume sampling pumps that can be calibrated and operated at a constant airflow up to 16 liters per minute when equipped with a sampling train of tubing and filter cassette.

b. Low-volume, battery powered, body-attachable, portable personal pumps that can be calibrated to a constant airflow up to approximately 3.5 liters per minute when equipped with a sampling train of tubing and filter cassette, and a self-contained rechargeable power pack capable of sustaining the calibrated flow rate for a minimum of 10 hours. The pumps shall also be equipped with an automatic flow control unit which shall maintain a constant flow, even as filter resistance increases due to accumulation of fiber and debris on the filter surface.

c. Single use standard 25 mm diameter cassette, open face, 0.8 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive extension cowl, and shrink bands, to be used with low flow pumps in accordance with 29 CFR 1926, Section .1101 for personal air sampling.

d. Single use standard 25 mm diameter cassette, open face, 0.45 micron pore size, mixed cellulose ester membrane filters and cassettes with 50 mm electrically conductive cowl, and shrink bands, to be used with high flow pumps when conducting environmental area sampling using NIOSH Pub No. 84-100 Methods 7400 and 7402, (and the transmission electric microscopy method specified at 40 CFR 763 if required).

e. Appropriate plastic tubing to connect the air sampling pump to the selected filter cassette.

f. A flow calibrator capable of calibration to within plus or minus 2 percent of reading over a temperature range of minus 4 to plus 140 degrees F and traceable to a NIST primary standard.

## 1.24 EXPENDABLE SUPPLIES

### 1.24.1 Glovebag

Glovebags shall be provided as described in 29 CFR 1926, Section .1101 and SET-UP DETAIL SHEET 10. The glovebag assembly shall be 6 mil thick plastic, prefabricated and seamless at the bottom with preprinted OSHA warning label.

1.24.2 Duct Tape

Industrial grade duct tape of appropriate widths suitable for bonding sheet plastic and disposal container shall be provided.

1.24.3 Disposal Containers

Leak-tight (defined as solids, liquids, or dust that cannot escape or spill out) disposal containers shall be provided for ACM wastes as required by 29 CFR 1926 Section .1101 and DETAIL SHEETS 9A, 9B, 9C and 14.

1.24.4 Disposal Bags

Leak-tight bags, 6 mil thick, shall be provided for placement of asbestos generated waste as described in DETAIL SHEET 9A.

1.24.5 Sheet Plastic

Sheet plastic shall be polyethylene of 6 mil minimum thickness and shall be provided in the largest sheet size necessary to minimize seams ,as indicated on the project drawings. Film shall be clear and conform to ASTM D 4397, except as specified below:

1.24.6 Amended Water

Amended water shall meet the requirements of ASTM D 1331.

1.24.7 Mastic Removing Solvent

Mastic removing solvent shall be nonflammable and shall not contain methylene chloride, glycol ether, or halogenated hydrocarbons. Solvents used onsite shall have a flash point greater than 140 degrees F.

1.24.8 Leak-tight Wrapping

Two layers of 6 mil minimum thick polyethylene sheet stock shall be used for the containment of removed asbestos-containing components or materials such as reactor vessels, large tanks, boilers, insulated pipe segments and other materials too large to be placed in disposal bags as described in DETAIL SHEET 9B. Upon placement of the ACM component or material, each layer shall be individually leak-tight sealed with duct tape.

1.24.9 Wetting Agents

Removal encapsulant (a penetrating encapsulant) shall be provided when conducting removal abatement activities that require a longer removal time or are subject to rapid evaporation of amended water. The removal encapsulant shall be capable of wetting the ACM and retarding fiber release during disturbance of the ACM greater than or equal to that provided by amended water. Performance requirements for penetrating encapsulants are specified in paragraph ENCAPSULANTS.

1.24.10 Strippable Coating

Strippable coating in aerosol cans shall be used to adhere to surfaces and to be removed cleanly by stripping, at the completion of work. This work shall only be done in well ventilated areas.

1.25 MISCELLANEOUS ITEMS

A sufficient quantity of other items, such as, but not limited to: scrapers, brushes, brooms, staple guns, tarpaulins, shovels, rubber squeegees, dust pans, other tools, scaffolding, staging, enclosed chutes, wooden ladders, lumber necessary for the construction of containments, UL approved temporary electrical equipment, material and cords, ground fault circuit interrupters, water hoses of sufficient length, fire extinguishers, first aid kits, portable toilets, logbooks, log forms, markers with indelible ink, spray paint in bright color to mark areas, project boundary fencing, etc., shall be provided.

## PART 2 PRODUCTS

### 2.1 ENCAPSULANTS

Encapsulants shall conform to USEPA requirements, shall contain no toxic or hazardous substances and no solvent and shall meet the following requirements:

ALL ENCAPSULANTS

| Requirement | Test Standard |
|---|---|
| Flame Spread - 25, Smoke Emission - 50 | ASTM E 84 |
| Combustion Toxicity Zero Mortality | Univ. of Pittsburgh Protocol |
| Life Expectancy, 20 yrs Accelerated Aging Test | ASTM C 732 |
| Permeability, Minimum 0.4 perms | ASTM E 96 |

## PART 3 EXECUTION

### 3.1 GENERAL REQUIREMENTS

Asbestos abatement work tasks shall be performed as shown on the detailed plans and drawings, as summarized in paragraph DESCRIPTION OF WORK and including Table 1 and the Contractor's Accident Prevention Plan, Asbestos Hazard Abatement Plan, and the Activity Hazard Analyses. The Contractor shall use the engineering controls and work practices required in 29 CFR 1926, Section .1101(g) in all operations regardless of the levels of exposure. Personnel shall wear and utilize protective clothing and equipment as specified. The Contractor shall not permit eating, smoking, drinking, chewing or applying cosmetics in the regulated area. All hot work (burning, cutting, welding, etc.) shall be conducted under controlled conditions in conformance with 29 CFR 1926, Section .352, Fire Prevention. Personnel of other trades, not engaged in asbestos abatement activities, shall not be exposed at any time to airborne concentrations of asbestos unless all the administrative and personal protective provisions of the Contractor's Accident Prevention Plan are complied with. Power to the regulated area shall be locked-out and tagged in accordance with 29 CFR 1910, and temporary electrical service with ground fault circuit interrupters shall be provided as needed. Temporary electrical service shall be disconnected when necessary for wet removal. The Contractor shall stop abatement work in the regulated area immediately when the airborne total fiber concentration: (1) equals or exceeds 0.01 f/cc, or the pre-abatement concentration, whichever is greater, outside the regulated area; or (2)

equals or exceeds 1.0 f/cc inside the regulated area. The Contractor shall correct the condition to the satisfaction of the Contracting Officer, including visual inspection and air sampling. Work shall resume only upon notification by the Contracting Officer. Corrective actions shall be documented.

## 3.2 PROTECTION OF ADJACENT WORK OR AREAS TO REMAIN

Asbestos abatement shall be performed without damage to or contamination of adjacent work or area. Where such work or area is damaged or contaminated, as verified by the Contracting Officer using visual inspection or sample analysis, it shall be restored to its original condition or decontaminated by the Contractor at no expense to the Government, as deemed appropriate by the Contracting Officer. This includes inadvertent spill of dirt, dust or debris in which it is reasonable to conclude that asbestos may exist. When these spills occur, work shall stop in all effected areas immediately and the spill shall be cleaned. When satisfactory visual inspection and air sampling analysis results are obtained and have been evaluated by the Contractor's Designated IH and the Contracting Officer, work shall proceed.

## 3.3 PRECLEANING

Surfaces shall be cleaned by HEPA vacuum and adequately wet wiped prior to establishment of containment.

## 3.4 METHODS OF COMPLIANCE

### 3.4.1 Mandated Practices

The Contractor shall employ proper handling procedures in accordance with 29 CFR 1926 and 40 CFR 61, Subpart M, and the specified requirements. The specific abatement techniques and items identified shall be detailed in the Contractor's Asbestos Hazard Abatement Plan including, but not limited to, details of construction materials, equipment, and handling procedures. The Contractor shall use the following engineering controls and work practices in all operations, regardless of the levels of exposure:

a. Vacuum cleaners equipped with HEPA filters to collect debris and dust containing ACM.

b. Wet methods or wetting agents to control employee exposures during asbestos handling, mixing, removal, cutting, application, and cleanup; except where it can be demonstrated that the use of wet methods is unfeasible due to, for example, the creation of electrical hazards, equipment malfunction, and in roofing.

c. Prompt clean-up and disposalin leak-tight containers of wastes and debris contaminated with asbestos.

d. Inspection and repair of polyethylene in work and high traffic areas.

e. Cleaning of equipment and surfaces of containers filled with ACM prior to removing them from the equipment room or area.

### 3.4.2 Control Methods

The Contractor shall use the following control methods to comply with the PELs:

a. Local exhaust ventilation equipped with HEPA filter dust collection systems;

b. Enclosure or isolation of processes producing asbestos dust;

c. Ventilation of the regulated area to move contaminated air away from the breathing zone of employees and toward a filtration or collection device equipped with a HEPA filter;

d. Use of other work practices and engineering controls;

e. Where the feasible engineering and work practice controls described above are not sufficient to reduce employee exposure to or below the PELs, the Contractor shall use them to reduce employee exposure to the lowest levels attainable by these controls and shall supplement them by the use of respiratory protection that complies with paragraph, RESPIRATORY PROTECTION PROGRAM.

3.4.3 Unacceptable Practices

The following work practices and engineering controls shall not be used for work related to asbestos or for work which disturbs ACM, regardless of measured levels of asbestos exposure or the results of initial exposure assessments:

a. High-speed abrasive disc saws that are not equipped with point of cut ventilator or enclosures with HEPA filtered exhaust air.

b. Compressed air used to remove asbestos, or materials containing asbestos, unless the compressed air is used in conjunction with an enclosed ventilation system designed to capture the dust cloud created by the compressed air.

c. Dry sweeping, shoveling, or other dry clean-up of dust and debris containing ACM.

d. Employee rotation as a means of reducing employee exposure to asbestos.

3.4.4 Negative Pressure Enclosure (NPE) System

The NPE system shall be as shown in SETUP DETAIL SHEET 4. The system shall provide at least 4 air changes per hour inside the containment. The local exhaust unit equipment shall be operated 24 hours per day until the containment is removed, and shall be leak-proof to the filter and equipped with HEPA filters. Air movement shall be directed away from the employees and toward a HEPA filtration device. The NPE shall be smoke tested for leaks at the beginning of each shift. Local exhaust equipment shall be sufficient to maintain a minimum pressure differential of minus 0.02 inch of water column relative to adjacent, unsealed areas. Pressure differential shall be monitored continuously, 24 hours per day, with an automatic manometric recording instrument. Pressure differential recordings shall be provided daily on the same day collected. Readings shall be reviewed by the Contractor's Designated Competent Person and IH prior to submittal. The Contracting Officer shall be notified immediately if the pressure differential falls below the prescribed minimum. The building ventilation system shall not be used as the local exhaust system

for the regulated area. The local exhaust system shall terminate outdoors unless an alternate arrangement is allowed by the Contract Officer. All filters used shall be new at the beginning of the project and shall be periodically changed as necessary and disposed of as ACM waste.

3.4.5 Class II Work

In addition to the requirements of paragraphs Mandated Practices and Control Methods, the following engineering controls and work practices shall be used:

a. A Competent Person shall supervise the work.

b. For indoor work, critical barriers shall be placed over all openings to the regulated area.

c. Impermeable dropcloths shall be placed on surfaces beneath all removal activity.

3.4.6 Specific Control Methods for Class II Work

In addition to requirements of paragraph Class II Work, Class II work shall be performed using the following methods:

3.4.6.1 Vinyl and Asphalt Flooring Materials

When removing vinyl and asphalt flooring materials which contain ACM, the Contractor shall use the following practices as shown in RESPONSE ACTION DETAIL SHEET 57. Resilient sheeting shall be removed by adequately wet methods. Tiles shall be removed intact (if possible); wetting is not required when tiles are heated and removed intact. Flooring or its backing shall not be sanded. Scraping of residual adhesive and/or backing shall be performed using wet methods. Mechanical chipping is prohibited unless performed in a negative pressure enclosure. Dry sweeping is prohibited. The Contractor shall use vacuums equipped with HEPA filter, disposable dust bag, and metal floor tool (no brush) to clean floors.

3.4.6.2 Roofing Material

Survey Contractor was able to sample the roof. It should be sampled if it is planned to be disturbed. The specification assumes that the sealant around vent pipes are ACM, due to results of other surveys completed on other Quad Buildings.

When removing roofing materials which contain ACM as described in 29 CFR 1926, Section .1101(g)(8)(ii), the Contractor shall use the following practices as shown in RESPONSE ACTION DETAIL SHEET 75. Roofing material shall be removed in an intact state. Wet methods shall be used to remove roofing materials that are not intact, or that will be rendered not intact during removal, unless such wet methods are not feasible or will create safety hazards. When removing built-up roofs, with asbestos-containing roofing felts and an aggregate surface, using a power roof cutter, all dust resulting from the cutting operations shall be collected by a HEPA dust collector, or shall be HEPA vacuumed by vacuuming along the cut line. Asbestos-containing roofing material shall not be dropped or thrown to the ground, but shall be lowered to the ground via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. Any ACM that is not intact shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. While the material remains

on the roof it shall be kept wet or placed in an impermeable waste bag or wrapped in plastic sheeting. Intact ACM shall be lowered to the ground as soon as practicable, but not later than the end of the work shift. Unwrapped material shall be transferred to a closed receptacle precluding the dispersion of dust. Critical barriers shall be placed over roof level heating and ventilation air intakes.

3.4.6.3 Caulking

The caulking around the exhaust fan outside of the kitchen (Dining Facility) contains asbestos. The material shall be wetted prior to scraping. All removed material shall be double bagged.

3.4.6.4 Other Class II Jobs

The Contractor shall use the following work practices when performing Class II removal of non friable ACM: The material shall be thoroughly wetted with amended water prior and during its removal. The material shall be removed in an intact state. Cutting, abrading or breaking the material is prohibited. The ACM removed shall be immediately bagged or wrapped.

3.4.7 Alternative Methods for Roofing Materials and Asphaltic Wrap

The Contractor shall use the following engineering controls and work practices when removing, repairing, or maintaining intact pipeline asphaltic wrap, or roof cements, mastics, coatings, or flashings which contain asbestos fibers encapsulated or coated by bituminous or resinous compounds. If during the course of the job the material does not remain intact, the Contractor shall use the procedures described in paragraph Roofing Material. Before work begins, and as needed during the job, the Designated Competent Person shall conduct an inspection and determine that the roofing material is intact and will likely remain intact. The material shall not be sanded, abraded, or ground. Manual methods which would render the material non-intact shall not be used. Roofing material shall not be dropped or thrown to the ground but shall be lowered via covered, dust-tight chute, crane, hoist or other method approved by the Contracting Officer. All such material shall be removed from the roof as soon as practicable, but not later than the end of the work shift. Removal or disturbance of pipeline asphaltic wrap shall be performed using wet methods.

3.4.8 Cleaning After Asbestos Removal

After completion of all asbestos removal work, surfaces from which ACM has been removed shall be wet wiped or sponged clean, or cleaned by some equivalent method to remove all visible residue. Run-off water shall be collected and filtered through a dual filtration system. A first filter shall be provided to remove fibers 20 micrometers and larger, and a final filter provided that removes fibers 5 micrometers and larger. After the gross amounts of asbestos have been removed from every surface, remaining visible accumulations of asbestos on floors shall be collected using plastic shovels, rubber squeegees, rubber dustpans, and HEPA vacuum cleaners as appropriate to maintain the integrity of the regulated area.

3.4.9 Class II Asbestos Work Response Action Detail Sheets

The following Class II Asbestos Work Response Action Detail Sheet is specified on Table 1 for each individual work task to be performed:

a. Vinyl Asbestos Tile Adhered to Concrete Floor System by Asbestos

Containing Adhesive: See Sheet 57

## 3.5 FINAL CLEANING AND VISUAL INSPECTION

Upon completion of abatement, the regulated area shall be cleaned by collecting, packing, and storing all gross contamination; see SET-UP DETAIL SHEETS 9 and 14. A final cleaning shall be performed using HEPA vacuum and wet cleaning of all exposed surfaces and objects in the regulated area.Upon completion of the cleaning, the Contractor shall conduct a visual pre-inspection of the cleaned area in preparation for a final inspection before final air clearance monitoring and recleaning, as necessary. Upon completion of the final cleaning, the Contractor and the Contracting Officer shall conduct a final visual inspection of the cleaned regulated area in accordance with ASTM E 1368 and document the results on the Final Cleaning and Visual Inspection as specified on the SET-UP DETAIL SHEET 19. If the Contracting Officer rejects the clean regulated area as not meeting final cleaning requirements, the Contractor shall reclean as necessary and have a follow-on inspection conducted with the Contracting Officer. Recleaning and follow-up reinspection shall be at the Contractor's expense.

## 3.6 LOCKDOWN

Prior to removal of plastic barriers and after clean-up of gross contamination and final visual inspection, a post removal (lockdown) encapsulant shall be spray applied to ceiling, walls, floors, and other surfaces in the regulated area.

## 3.7 EXPOSURE ASSESSMENT AND AIR MONITORING

### 3.7.1 General Requirements For Exposure

Exposure assessment, air monitoring and analysis of airborne concentration of asbestos fibers shall be performed in accordance with 29 CFR 1926, Section .1101, the Contractor's air monitoring plan, and as specified. Personal exposure air monitoring (collected at the breathing zone) that is representative of the exposure of each employee who is assigned to work within a regulated area shall be performed by the Contractor's Designated IH. Breathing zone samples shall be taken for at least 25 percent of the workers in each shift, or a minimum of 2, whichever is greater. Air monitoring results at the 95 percent confidence level shall be calculated as shown in Table 2 at the end of this section. The Contractor shall provide an onsite independent testing laboratory with qualified analysts and appropriate equipment to conduct sample analyses of air samples using the methods prescribed in 29 CFR 1926, Section .1101, to include NIOSH Pub No. 84-100 Method 7400. Preabatement and abatement environmental air monitoring shall be performed by the Contractor's Designated IH. Final clearance environmental air monitoring, shall be performed by the Contractor's Designated IH. Environmental and final clearance air monitoring shall be performed using NIOSH Pub No. 84-100 Method 7400 (PCM). For environmental and final clearance, air monitoring shall be conducted at a sufficient velocity and duration to establish the limit of detection of the method used at 0.005 f/cc. When such confirmation is conducted, it shall be from the same sample filter used for the NIOSH Pub No. 84-100 Method 7400 PCM analysis. For all Contractor required environmental or final clearance air monitoring, confirmation of asbestos fiber concentrations, using NIOSH Pub No. 84-100 Method 7402, shall be at the Contractor's expense. Monitoring may be duplicated by the Government at the discretion of the Contracting Officer. Results of breathing zone samples shall be posted at the job site and made available to the

Contracting Officer. The Contractor shall maintain a fiber concentration inside a regulated area less than or equal to 0.1 f/cc expressed as an 8 hour, time-weighted average (TWA) during the conduct of the asbestos abatement. If fiber concentration rises above 0.1 f/cc, work procedures shall be investigated with the Contracting Officer to determine the cause. At the discretion of the Contracting Officer, fiber concentration may exceed 0.1 f/cc but shall not exceed 1.0 f/cc expressed as an 8-hour TWA. The Contractor's workers shall not be exposed to an airborne fiber concentration in excess of 1.0 f/cc, as averaged over a sampling period of 30 minutes. Should either an environmental concentration of 1.0 f/cc expressed as an 8-hour TWA or a personal excursion concentration of 1.0 f/cc expressed as a 30-minute sample occur inside a regulated work area, the Contractor shall stop work immediately, notify the Contracting Officer, and implement additional engineering controls and work practice controls to reduce airborne fiber levels below prescribed limits in the work area. Work shall not restart until authorized by the Contracting Officer.

3.7.2 Initial Exposure Assessment

The Contractor's Designated IH shall conduct an exposure assessment immediately before or at the initiation of an asbestos abatement operation to ascertain expected exposures during that operation. The assessment shall be completed in time to comply with the requirements which are triggered by exposure data or the lack of a negative exposure assessment, and to provide information necessary to assure that all control systems planned are appropriate for that operation. The assessment shall take into consideration both the monitoring results and all observations, information or calculations which indicate employee exposure to asbestos, including any previous monitoring conducted in the workplace, or of the operations of the Contractor which indicate the levels of airborne asbestos likely to be encountered on the job.

3.7.3 Negative Exposure Assessment

The Contractor shall provide a negative exposure assessment for the specific asbestos job which will be performed. The negative exposure assessment shall be provided within 5 days of the initiation of the project and conform to the following criteria:

a. Objective Data: Objective data demonstrating that the product or material containing asbestos minerals or the activity involving such product or material cannot release airborne fibers in concentrations exceeding the PEL-TWA and PEL-Excursion Limit under those work conditions having the greatest potential for releasing asbestos.

b. Prior Asbestos Jobs: Where the Contractor has monitored prior asbestos jobs for the PEL and the PEL-Excursion Limit within 12 months of the current job, the monitoring and analysis were performed in compliance with asbestos standard in effect; the data were obtained during work operations conducted under workplace conditions closely resembling the processes, type of material, control methods, work practices, and environmental conditions used and prevailing in the Contractor's current operations; the operations were conducted by employees whose training and experience are no more extensive than that of employees performing the current job; and these data show that under the conditions prevailing and which will prevail in the current workplace, there is a high degree of certainty that the monitoring covered exposure

from employee exposures will not exceed the PEL-TWA and PEL-Excursion Limit.

c. Initial Exposure Monitoring: The results of initial exposure monitoring of the current job, made from breathing zone air samples that are representative of the 8-hour PEL-TWA and 30-minute short-term exposures of each employee. The monitoring covered exposure from operations which are most likely during the performance of the entire asbestos job to result in exposures over the PELs.

3.7.4 Preabatement Environmental Air Monitoring

Preabatement environmental air monitoring shall be established 1 day prior to the masking and sealing operations for each regulated area to determine background concentrations before abatement work begins. As a minimum, preabatement air samples shall be collected using NIOSH Pub No. 84-100 Method 7400, PCM at these locations: outside the building; inside the building, but outside the regulated area perimeter; and inside each regulated work area. One sample shall be collected for every 2000 square feet of floor space. At least 2 samples shall be collected outside the building: at the exhaust of the HEPA unit; and downwind from the abatement site. The PCM samples shall be analyzed within 24 hours; and if any result in fiber concentration greater than 0.01 f/cc. Area shall be resampled.

3.7.5 Environmental Air Monitoring During Abatement

Until an exposure assessment is provided to the Contracting Officer, environmental air monitoring shall be conducted at locations and frequencies that will accurately characterize any evolving airborne asbestos fiber concentrations. The assessment shall demonstrate that the product or material containing asbestos minerals, or the abatement involving such product or material, cannot release airborne asbestos fibers in concentrations exceeding 0.01 f/cc as a TWA under those work conditions having the greatest potential for releasing asbestos. The monitoring shall be at least once per shift at locations including, but not limited to, close to the work inside a regulated area; preabatement sampling locations; outside entrances to a regulated area; close to glovebag operations; representative locations outside of the perimeter of a regulated area; inside clean room; and at the exhaust discharge point of local exhaust system ducted to the outside of a containment (if used). If the sampling outside regulated area shows airborne fiber levels have exceeded background or 0.01 f/cc, whichever is greater, work shall be stopped immediately, and the Contracting Officer notified. The condition causing the increase shall be corrected. Work shall not restart until authorized by the Contracting Officer.

3.7.6 Final Clearance Air Monitoring

Prior to conducting final clearance air monitoring, the Contractor and the Contracting Officer shall conduct a final visual inspection of the regulated area where asbestos abatement has been completed. The final visual inspection shall be as specified in SET-UP DETAIL SHEET 19. Final clearance air monitoring shall not begin until acceptance of the Contractor's final cleaning by the Contracting Officer. The Contractor's Designated IH shall conduct final clearance air monitoring using aggressive air sampling techniques as defined in EPA 560/5-85-024 or as otherwise required by federal or state requirements. The sampling and analytical method used will be NIOSH Pub No. 84-100 Method 7400 (PCM).

3.7.6.1 Final Clearance Requirements, NIOSH PCM Method

For PCM sampling and analysis using NIOSH Pub No. 84-100 Method 7400, the fiber concentration inside the abated regulated area, for each airborne sample, shall be less than 0.01 f/cc. The abatement inside the regulated area is considered complete when every PCM final clearance sample is below the clearance limit. If any sample result is greater than 0.01 total f/cc, the asbestos fiber concentration (asbestos f/cc) shall be confirmed from that same filter using NIOSH Pub No. 84-100 Method 7402 (TEM) at Contractor's expense. If any confirmation sample result is greater than 0.01 asbestos f/cc, abatement is incomplete and cleaning shall be repeated. Upon completion of any required recleaning, resampling with results to meet the above clearance criteria shall be done.

3.7.6.2 Air Clearance Failure

If clearance sampling results fail to meet the final clearance requirements, the Contractor shall pay all costs associated with the required recleaning, resampling, and analysis, until final clearance requirements are met.

3.7.7 Air-Monitoring Results and Documentation

Air sample fiber counting shall be completed and results provided within 24 hours (breathing zone samples), and 24 hours (environmental/clearance monitoring) after completion of a sampling period. The Contracting Officer shall be notified immediately of any airborne levels of asbestos fibers in excess of established requirements. Written sampling results shall be provided within 5 working days of the date of collection. The written results shall be signed by testing laboratory analyst, testing laboratory principal and the Contractor's Designated IH. The air sampling results shall be documented on a Contractor's daily air monitoring log. The daily air monitoring log shall contain the following information for each sample:

a. Sampling and analytical method used;

b. Date sample collected;

c. Sample number;

d. Sample type: BZ = Breathing Zone (Personal), P = Preabatement, E = Environmental, C = Abatement Clearance;

e. Location/activity/name where sample collected;

f. Sampling pump manufacturer, model and serial number, beginning flow rate, end flow rate, average flow rate (L/min);

g. Calibration date, time, method, location, name of calibrator, signature;

h. Sample period (start time, stop time, elapsed time (minutes);

i. Total air volume sampled (liters);

j. Sample results (f/cc and S/mm square) if EPA methods are required for final clearance;

k. Laboratory name, location, analytical method, analyst, confidence level. In addition, the printed name and a signature and date block for the Industrial Hygienist who conducted the sampling and for the Industrial Hygienist who reviewed the daily air monitoring log verifying the accuracy of the information.

## 3.8 CLEARANCE CERTIFICATION

When asbestos abatement is complete, ACM waste is removed from the regulated areas, and final clean-up is completed, the Contracting Officer will certify the areas as safe before allowing the warning signs and boundary warning tape to be removed. After final clean-up and acceptable airborne concentrations are attained, but before the HEPA unit is turned off and the containment removed, the Contractor shall remove all pre-filters on the building HVAC system and provide new pre-filters. The Contractor shall dispose of such filters as asbestos contaminated materials. HVAC, mechanical, and electrical systems shall be re-established in proper working order. The Contractor and the Contracting Officer shall visually inspect all surfaces within the containment for residual material or accumulated debris. The Contractor shall reclean all areas showing dust or residual materials. The Contracting Officer will certify in writing that the area is safe before unrestricted entry is permitted. The Government will have the option to perform monitoring to certify the areas are safe before entry is permitted.

## 3.9 CLEANUP AND DISPOSAL

### 3.9.1 Title to ACM Materials

ACM material resulting from abatement work, except as specified otherwise, shall become the property of the Contractor and shall be disposed of as specified and in accordance with applicable federal, state and local regulations.

### 3.9.2 Collection and Disposal of Asbestos

All ACM waste shall be collected and including contaminated wastewater filters, scrap, debris, bags, containers, equipment, and asbestos contaminated clothing, shall be collected and placed in leak-tight containers such as double plastic bags (see DETAIL SHEET 9A). Waste within the containers shall be wetted in case the container is breeched. Asbestos-containing waste shall be disposed of at an EPA, state and local approved asbestos landfill. For temporary storage, sealed impermeable containers shall be stored in an asbestos waste load-out unit or in a storage/transportation conveyance (i.e., dumpster, roll-off waste boxes, etc.) in a manner acceptable to and in an area assigned by the Contracting Officer. Procedure for hauling and disposal shall comply with 40 CFR 61, Subpart M, state, regional, and local standards.

### 3.9.3 Scale Weight Measurement

Scales used for measurement shall be public scales. Weighing shall be at a point nearest the work at which a public scale is available. Scales shall be standard truck scales of the beam type; scales shall be equipped with the type registering beam and an "over and under" indicator; and shall be capable of accommodating the entire vehicle. Scales shall be tested, approved and sealed by an inspector of the State of Hawaii. Scales shall be calibrated and resealed as often as necessary and at least once every three months to ensure continuous accuracy. Vehicles used for hauling ACM

shall be weighed empty daily at such time as directed and each vehicle shall bear a plainly legible identification mark.

3.9.4 Weigh Bill and Delivery Tickets

Copies of weigh bills and delivery tickets shall be submitted to the Contracting Officer during the progress of the work. The Contractor shall furnish the Contracting Officer scale tickets for each load of ACM weighed and certified. These tickets shall include tare weight; identification mark for each vehicle weighed; and date, time and location of loading and unloading. Tickets shall be furnished at the point and time individual trucks arrive at the worksite. A master log of all vehicle loading shall be furnished for each day of loading operations. Before the final statement is allowed, the Contractor shall file with the Contracting Officer certified weigh bills and/or certified tickets and manifests of all ACM actually disposed by the Contractor for this contract.

3.9.5 Asbestos Waste Shipment Record

The Contractor shall complete and provide the Contracting Officer final completed copies of the Waste Shipment Record for all shipments of waste material as specified in 40 CFR 61, Subpart M and other required state waste manifest shipment records, within 3 days of delivery to the landfill. Each Waste Shipment Record shall be signed and dated by the Contractor, the waste transporter and disposal facility operator.

TABLE 1

INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet 1 of 1

There is a separate data sheet for each individual work task.

1. WORK TASK DESIGNATION NUMBER: 01_____
2. LOCATION OF WORK TASK: Quad C Schofield Barrracks (Bldg 355, 356, 357 and 358 _____
3. BRIEF DESCRIPTION OF MATERIAL TO BE ABATED: Asbestos floor tile, mastic and caulking_____

   a. Type of Asbestos: Chrysotile _____
   b. Percent asbestos content: 5%_____

4. ABATEMENT TECHNIQUE TO BE USED: wet method_____
5. OSHA ASBESTOS CLASS DESIGNATION FOR WORK TASK: Class II_____
6. EPA NESHAP FRIABILITY DESIGNATION FOR WORK TASK
   Friable _____ Non-friable Category I __x___
   Non-friable Category II_____
7. FORM _____ and CONDITION OF ACM: GOOD_____ FAIR_____ POOR_____
8. QUANTITY: METERS_____, SQUARE METERS_____
8a. QUANTITY: LINEAR FT._____, SQUARE FT._____
9. RESPONSE ACTION DETAIL SHEET NUMBER FOR WORK TASK_____
10. SET-UP DETAIL SHEET NUMBERS
    FOR WORK TASK 4, 9A, 11, 12, 13, 14, 15, 19, 22, 23, 45, 57.

NOTES:

(1) Numeric sequence of individual work tasks (1,2,3,4, etc.) for each regulated area. Each category of EPA friability/OSHA class has a separate task.
(2) Specific location of work (building, floor, area, e.g., Building 1421, 2nd Floor, Rm 201)
(3) A description of material to be abated (example: horizontal pipe, cement wall panels, tile, stucco, etc.) type of asbestos (chrysotile, amosite, crocidolite, etc.); and % asbestos content.
(4) Technique to be used: Removal = REM; Encapsulation = ENCAP; Encasement = ENCAS; Enclosure = ENCL; Repair = REP.
(5) Class designation: Class I, II, III, or IV (OSHA designation).
(6) Friability of materials: Check the applicable EPA NESHAP friability designation.
(7) Form: Interior or Exterior Architectural = IA or EA; Mechanical/Electrical = ME.
    Condition: Good = G; Fair = F; Poor = P.
(8) Quantity of ACM for each work task in meters or square meters.
(8a) Quantity of ACM for each work task in linear feet or square feet.
(9) Response Action Detail Sheet specifies the material to be abated and the methods to be used. There is only one Response Action Detail Sheet for each abatement task.
(10) Set-up Detail Sheets indicate containment and control methods used in support of the response action (referenced in the selected Response Action Detail Sheet).

TABLE 2

FORMULA FOR CALCULATION OF THE 95 PERCENT CONFIDENCE LEVEL
(Reference: NIOSH 7400)

---

Fibers/cc(01.95 percent CL) = X + [(X) * (1.645) * (CV)]

Where: X = ((E)(AC))/((V)(1000))

E = ((F/Nf) - (B/Nb))/Af

CV = The precision value; 0.45 shall be used unless the analytical laboratory provides the Contracting Officer with documentation (Round Robin Program participation and results) that the laboratory's precision is better.

AC = Effective collection area of the filter in square millimeters

V = Air volume sampled in liters

E = Fiber density on the filter in fibers per square millimeter

F/Nf = Total fiber count per graticule field

B/Nb = Mean field blank count per graticule field

Af = Graticule field area in square millimeters

TWA = C1/T1 + C2/T2 = Cn/Tn

Where: C = Concentration of contaminant

T = Time sampled.

TABLE 3

NIOSH METHOD 7400

PCM ENVIRONMENTAL AIR SAMPLING PROTOCOL (NON-PERSONAL)

| Sample Location | Minimum No. of Samples | Filter Pore Size (Note 1) | Min. Vol. (Note 2) (Liters) | Sampling Rate (liters/min.) |
|---|---|---|---|---|
| Inside Abatement Area | 0.5/140 Square Meters (Notes 3 & 4) | 0.45 microns | 3850 | 2-16 |
| Each Room in 1 Abatement Area Less than 140 Square meters | | 0.45 microns | 3850 | 2-16 |
| Field Blank | 2 | 0.45 microns | 0 | 0 |
| Laboratory Blank | 1 | 0.45 microns | 0 | 0 |

Notes:

1. Type of filter is Mixed Cellulose Ester.

2. Ensure detection limit for PCM analysis is established at 0.005 fibers/cc.

3. One sample shall be added for each additional 140 square meters. (The corresponding I-P units are 5/1500 square feet).

4. A minimum of 5 samples are to be taken per abatement area, plus 2 field blanks.

TABLE 4

EPA AHERA METHOD: TEM AIR SAMPLING PROTOCOL

| Location Sampled | Minimum No. of Samples | Filter Pore Size | Min. Vol. (Liters) | Sampling Rate (liters/min.) |
|---|---|---|---|---|
| Inside Abatement Area | 5 | 0.45 microns | 1500 | 2-16 |
| Outside Abatement Area | 5 | 0.45 microns | 1500 | 2-16 |
| Field Blank | 2 | 0.45 microns | 0 | 0 |
| Laboratory Blank | 1 | 0.45 microns | 0 | 0 |

Notes:

1. Type of filter is Mixed Cellulose Ester.
2. The detection limit for TEM analysis is 70 structures/square mm.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

PROJECT NAME _____ CONTRACT NO. _____
PROJECT ADDRESS _____
CONTRACTOR FIRM NAME _____
EMPLOYEE'S NAME _____, _____, _____,
(Print) (Last) (First) (MI)

Social Security Number: _____-_____-_____,

WORKING WITH ASBESTOS CAN BE DANGEROUS. INHALING ASBESTOS FIBERS HAS BEEN LINKED WITH TYPES OF LUNG DISEASE AND CANCER. IF YOU SMOKE AND INHALE ASBESTOS FIBERS, THE CHANCE THAT YOU WILL DEVELOP LUNG CANCER IS GREATER THAN THAT OF THE NONSMOKING PUBLIC.

Your employer's contract for the above project requires that you be provided and you complete formal asbestos training specific to the type of work you will perform and project specific training; that you be supplied with proper personal protective equipment including a respirator, that you be trained in its use; and that you receive a medical examination to evaluate your physical capacity to perform your assigned work tasks, under the environmental conditions expected, while wearing the required personal protective equipment. These things are to be done at no cost to you. By signing this certification, you are acknowledging that your employer has met these obligations to you. The Contractor's Designated Industrial Hygienist will check the block(s) for the type of formal training you have completed. Review the checked blocks prior to signing this certification.

FORMAL TRAINING:

_____ a. For Competent Persons and Supervisors: I have completed EPA's Model Accreditation Program (MAP) training course, "Contractor/Supervisor", that meets this State's requirements.

b. For Workers:

_____ (1) For OSHA Class I work: I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

_____ (2) For OSHA Class II work (where there will be abatement of more than one type of Class II materials, i.e., roofing, siding, floor tile, etc.): I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

(3) For OSHA Class II work (there will only be abatement of one type of Class II material):

_____ (a) I have completed an 8-hour training class on the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls of 29 CFR 1926, Section .1101(g) and hands-on training.

_____ (b) I have completed EPA's MAP training course, "Worker", that meets this State's requirements.

_____ (4) For OSHA Class III work: I have completed at least a 16-hour course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, Section .92(a)(2) and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101, and hands-on training.

CERTIFICATE OF WORKER'S ACKNOWLEDGMENT

_____ (5) For OSHA Class IV work: I have completed at least a 2-hr course consistent with EPA requirements for training of local education agency maintenance and custodial staff at 40 CFR 763, (a)(1), and the elements of 29 CFR 1926, Section .1101(k)(9)(viii), in addition to the specific work practices and engineering controls at 29 CFR 1926, Section .1101(g) and hands-on training.

_____ c. Workers, Supervisors and the Designated Competent Person: I have completed annual refresher training as required by EPA's MAP that meets this State's requirements.

PROJECT SPECIFIC TRAINING:
_____ I have been provided and have completed the project specific training required by this Contract. My employer's Designated Industrial Hygienist and Designated Competent Person conducted the training.

RESPIRATORY PROTECTION:
_____ I have been trained in accordance with the criteria in the Contractor's Respiratory Protection program. I have been trained in the dangers of handling and breathing asbestos dust and in the proper work procedures and use and limitations of the respirator(s) I will wear. I have been trained in and will abide by the facial hair and contact lens use policy of my employer.

RESPIRATOR FIT-TEST TRAINING:
_____ I have been trained in the proper selection, fit, use, care, cleaning,maintenance, and storage of the respirator(s) that I will wear. I have been fit-tested in accordance with the criteria in the Contractor's Respiratory Program and have received a satisfactory fit. I have been assigned my individual respirator. I have been taught how to properly perform positive and negative pressure fit-check upon donning negative pressure respirators each time.

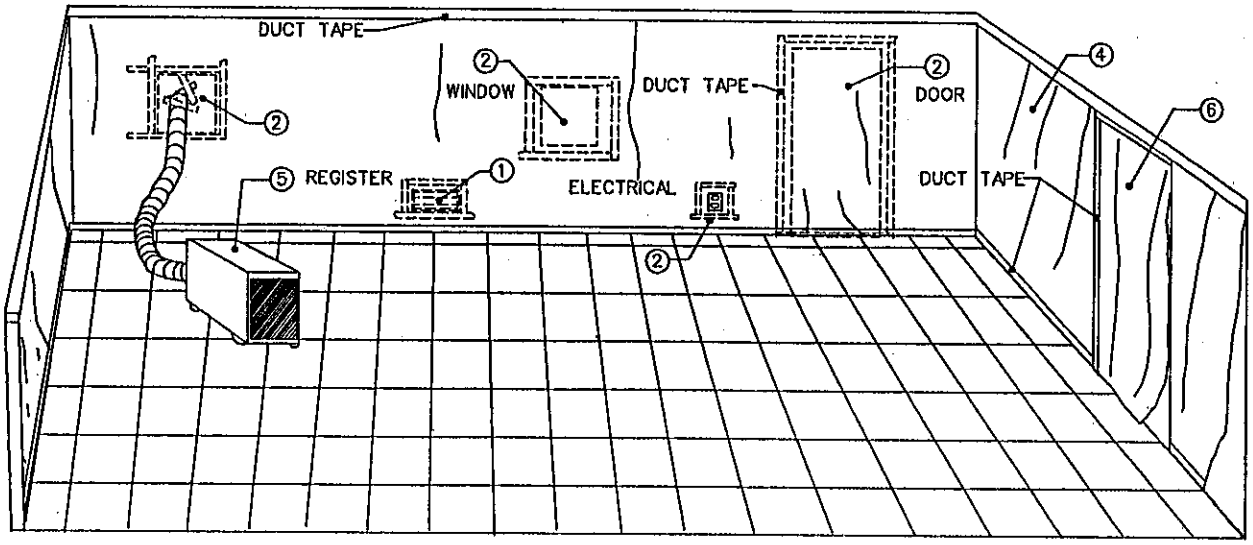
MEDICAL EXAMINATION:
_____ I have had a medical examination within the last twelve months which was paid for by my employer. The examination included: health history, pulmonary function tests, and may have included an evaluation of a chest x-ray. A physician made a determination regarding my physical capacity to perform work tasks on the project while wearing personal protective equipment including a respirator. I was personally provided a copy and informed of the results of that examination. My employer's Industrial Hygienist evaluated the medical certification provided by the physician and checked the appropriate blank below. The physician determined that there:

_____ were no limitations to performing the required work tasks.
_____ were identified physical limitations to performing the required work tasks.

Date of the medical examination _____

Employee Signature _____ date _____
Contractor's Industrial
Hygienist Signature _____ date _____

-- End of Section --




## Installation of critical barrier and full containment area (for vinyl tile floors)

1. Establish work area so that unauthorized entry is prevented; see sheet 11. Eliminate airflow into containment area by isolating all supply and return air ducts from mechanical system. Lock doors and windows not required for access.

2. Install 6-mil polyethylene critical barriers over all windows, doors, wall openings, electrical outlets, etc. Secure with duct tape on all sides. HEPA vacuum furniture, fixtures, and equipment and remove from or protect in containment area, as specified by the contract.

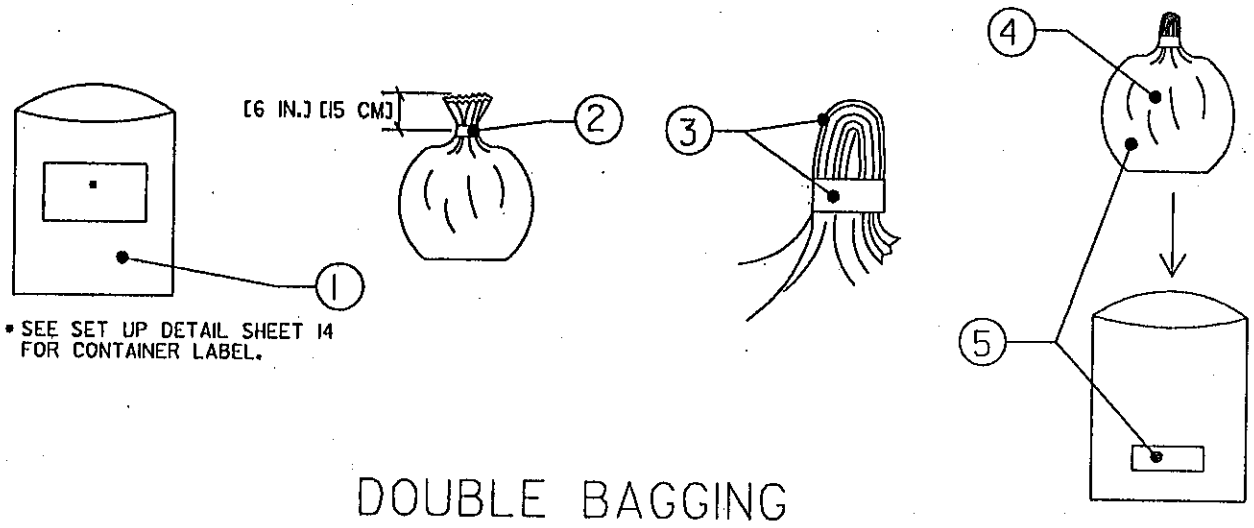
3. Prepare area as follows: turn off electrical power and remove light fixtures. Protect ceiling as required. HEPA vacuum floors and walls.

4. Protect wall surface with 6-mil polyethylene from floor to ceiling. Install viewing inspection windows, where feasible.

5. Install HEPA filter unit and duct work; see sheet 8.

6. Prepare door into decontamination unit or load-out unit; see sheet 22 for decontamination unit and sheet 20 for load-out unit. Doors that swing into the work area must be removed from hinges.

**Final clearance requirements.** After abatement has been completed, see sheet 18 for final clearance requirements.




DOUBLE BAGGING

## Containers—double bagging

1. Place the still-wet asbestos-containing and asbestos-contaminated material into a prelabled 6-mil polyethylene bag. Do not overfill. Do not use bag for asbestos-containing or asbestos-contaminated material that could puncture the bag. (See sheet 9C for packaging items that could puncture bags.)

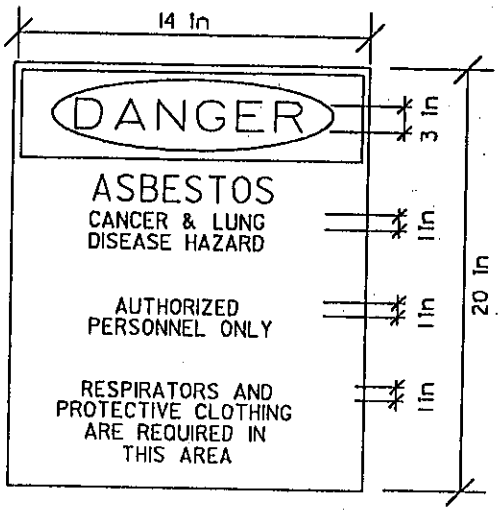
2. Evacuate with HEPA vacuum, and seal collapsed bag by twisting top [6 in] [15 cm] closed and wrapping with a minimum of two layers of duct tape.

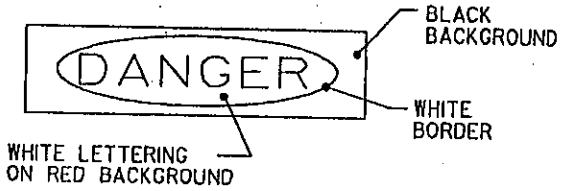
3. Twist top and fold over. Apply second wrap of duct tape.

4. Adequately wet clean outside of disposal bag by wet wiping, and take bag to the equipment and staging area.

5. Place bag inside a second prelabled 6-mil polyethylene bag.

6. Seal outer bag by repeating steps 2 and 3 above. Take bag to load-out unit; see sheet 20.




AREA WARNING SIGNS AND WARNING TAPE

DETAIL 011

## Area warning signs and warning tape

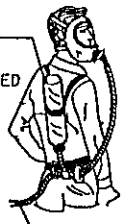
1. Provide and install [4 mil] [0.10 mm] polyethylene warning tape at locations shown on the abatement area plan.

2. Warning tape is to be attached to wood or metal posts at [10 ft] [300 cm] on center. Tape must be [3 ft] [100 cm] from ground.

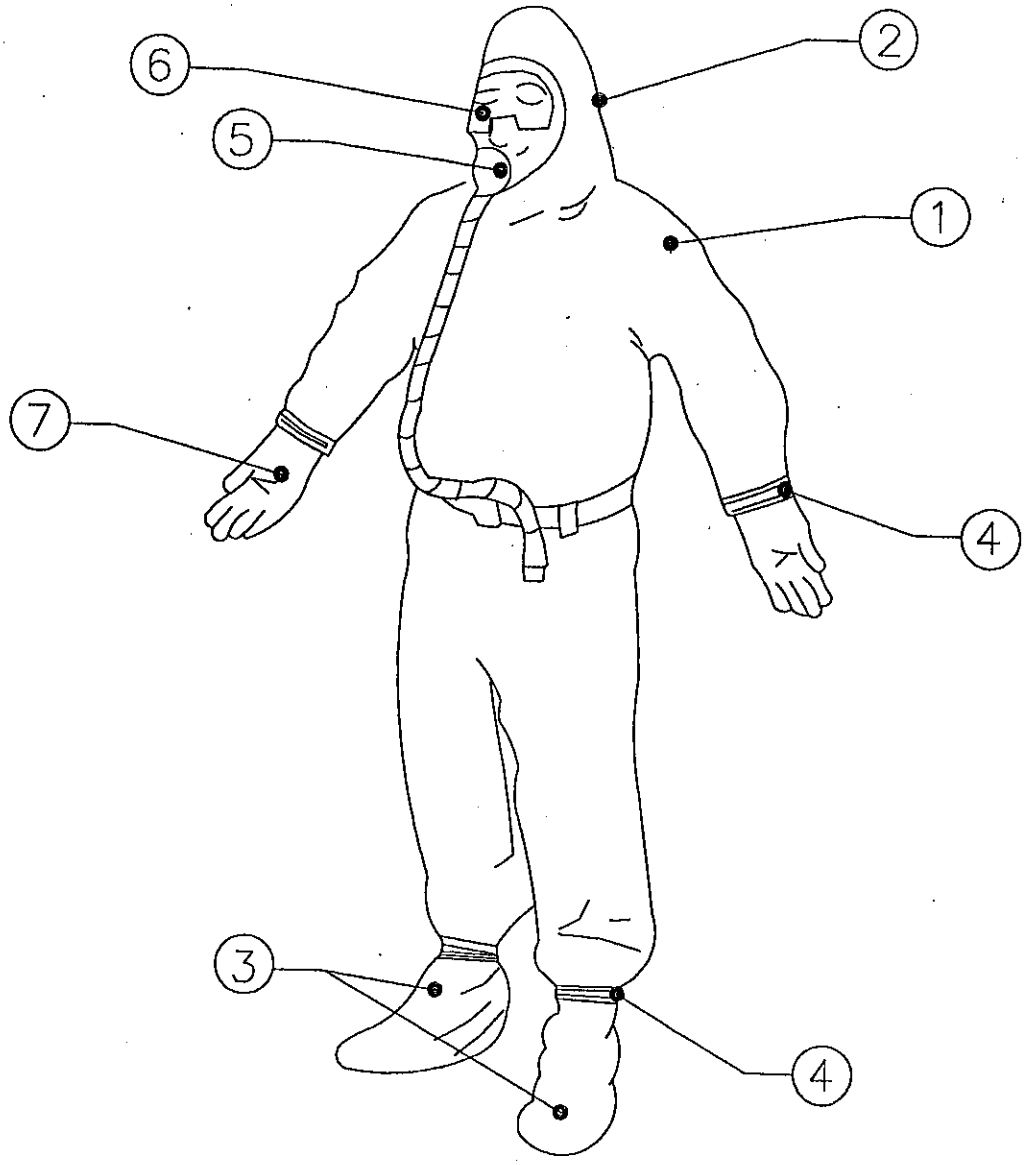
3. Attach both warning signs at each entrance of the work area and at [33 yd] [30 m] on center where security fencing is installed.

4. Warning signs must be in English and other languages required by the contract.

5. Install at eye level.

| FIBER CONCENTRATION | MINIMUM REQUIRED RESPIRATOR | |
|---|---|---|
| NOT IN EXCESS OF 1 FIBER/CC | HALF-MASK AIR PURIFYING RESPIRATOR WITH HEPA FILTERS | |
| NOT IN EXCESS OF 5 FIBERS/CC | FULL FACEPIECE AIR-PURIFYING RESPIRATOR WITH HEPA FILTERS | |
| NOT IN EXCESS OF 10 FIBERS/CC | LOOSE FITTING HELMET OR HOOD, POWERED AIR-PURIFYING RESPIRATOR WITH HEPA FILTERS | |
| NOT IN EXCESS OF 10 FIBERS/CC | POWERED AIR-PURIFYING RESPIRATOR WITH FULL FACEPIECE AND HEPA FILTER | |
| NOT IN EXCESS OF 10 FIBERS/CC | LOOSE FITTING HELMET OR HOOD, SUPPLIED AIR RESPIRATOR OPERATED IN CONTINUOUS FLOW MODE WITH BACK-UP HEPA FILTER | |
| NOT IN EXCESS OF 10 FIBERS/CC | SUPPLIED AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN CONTINUOUS FLOW MODE WITH BACK-UP HEPA FILTER | |
| NOT IN EXCESS OF 100 FIBERS/CC | FULL FACEPIECE SUPPLIED AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND MODE WITH BACK-UP HEPA FILTER | |
| GREATER THAN 100 FIBERS/CC OR UNKNOWN CONCENTRATION | FULL FACEPIECE SUPPLIED-AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND MODE WITH AUXILIARY POSITIVE-PRESSURE SELF-CONTAINED BREATHING APPARATUS |   |

**Respiratory protection table**




## Protective clothing

1. Disposable or reusable full body suit with elastic around hood and shoe cover openings is required or as otherwise specified in the contract.

2. Hood shall be worn over respirator's head and neck straps.

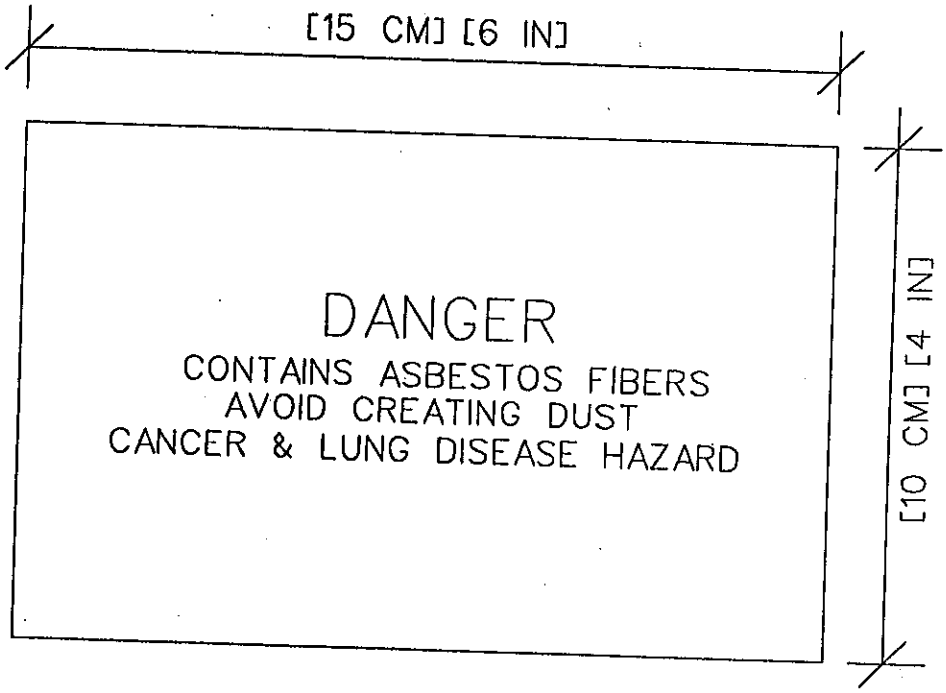
3. Shoe covers shall be worn over work shoes.

4. Cuffs shall be taped with duct tape at wrists and ankles in order to prevent infiltration.

5. Cartridge-type air-purifying HEPA filter respirator is minimal requirement. Type shall be selected in accordance with sheet 12.

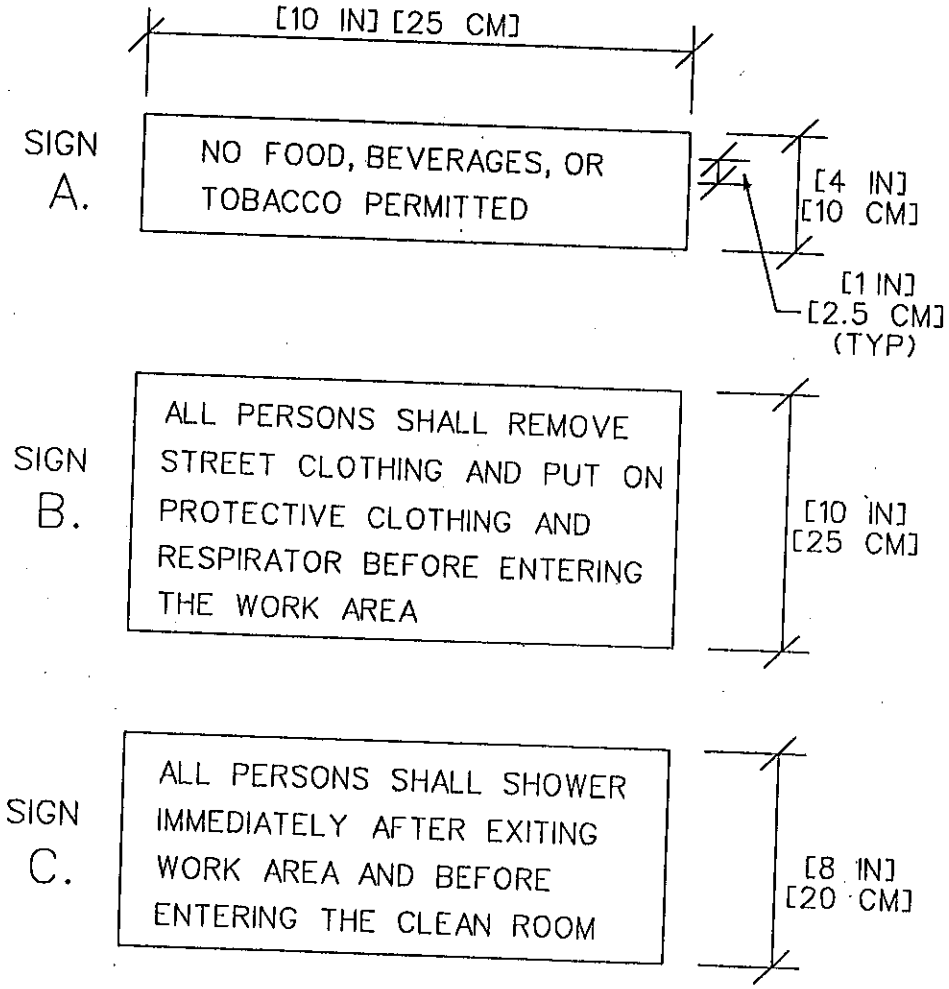
6. If eye protection is not integral with respirator, protection goggles are required.

7. Rubber work gloves are recommended to be worn alone or under outer work gloves provided for hand and operation safety.




**Disposal container label**

Attach warning labels to each disposal container removed from abatement area.




## Decontamination unit signage

1. Provide signs in English and other languages required by the contract.
2. Install at eye level.

## Certification of Final Cleaning And Visual Inspection

Individual abatement task as identified in paragraph, Description of Work _____

In accordance with the cleaning and decontamination procedures specified in the Contractor's asbestos hazard abatement plan and this contract, the Contractor hereby certifies that he/she has thoroughly visually inspected the decontaminated regulated work area (all surfaces, including pipes, beams, ledges, walls, ceiling, floor, decontamination unit, etc.) in accordance with ASTM E1368, *Standard Practice for Visual Inspection of Asbestos Abatement Projects*, and has found no dust, debris, or asbestos-containing material residue.

BY: (Contractor's signature) _____ Date _____
Print name and title _____

(Contractor's Onsite Supervisor signature) _____ Date _____
Print name and title _____

(Contractor's Industrial Hygienist signature) _____ Date _____
Print name and title _____

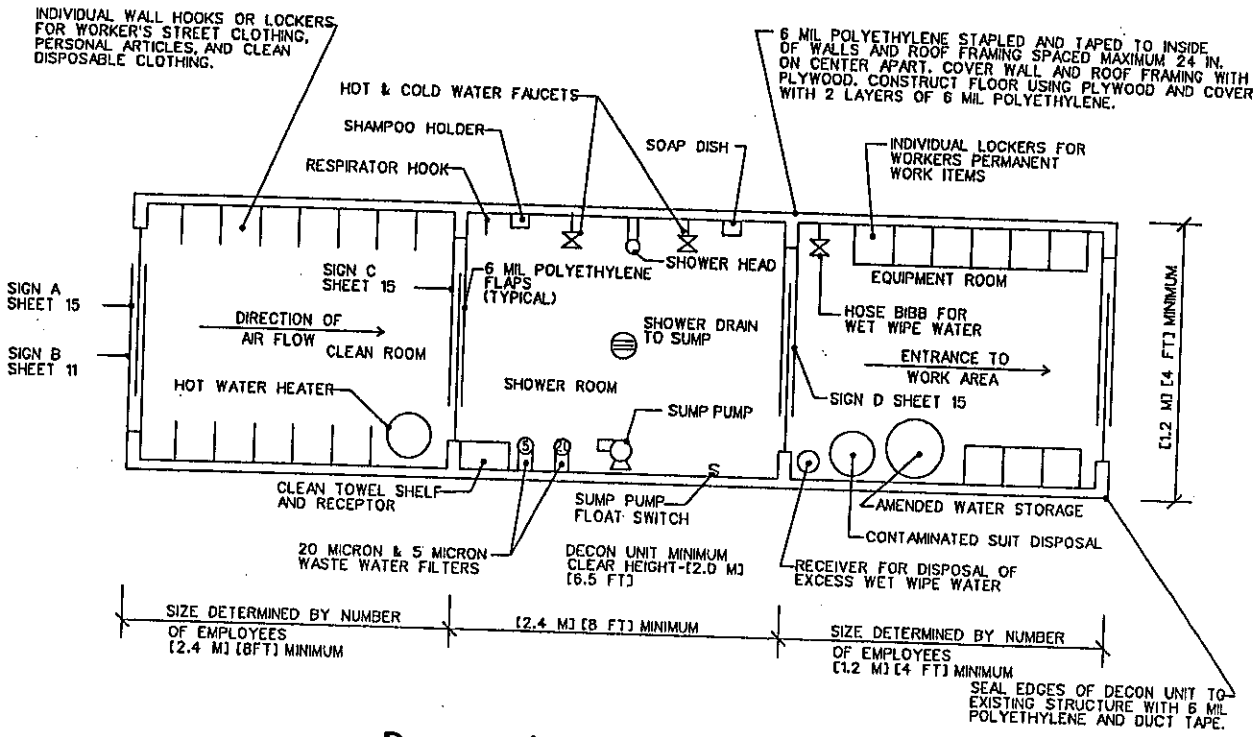
### Contracting Officer Acceptance or Rejection

The Contracting Officer hereby determines that the Contractor has performed final cleaning and visual inspection of the decontaminated regulated work area (all surfaces including pipes, beams, ledges, walls, ceiling, floor, decontamination unit, etc.) and by quality assurance inspection, finds the Contractor's final cleaning to be:

☐ Acceptable

☐ Unacceptable, Contractor instructed to reclean the regulated work area.

BY: Contracting Officer's Representative
Signature _____ Date _____
Print name and title _____




## Decontamination unit floor plan

1. Establish work area so that unauthorized entry is prevented; see sheets 11 and 15. Before entering the work area, all personnel shall remove their street clothing in the clean room and put on protective clothing and respirator.

2. Whenever exiting the work area, all personnel shall:

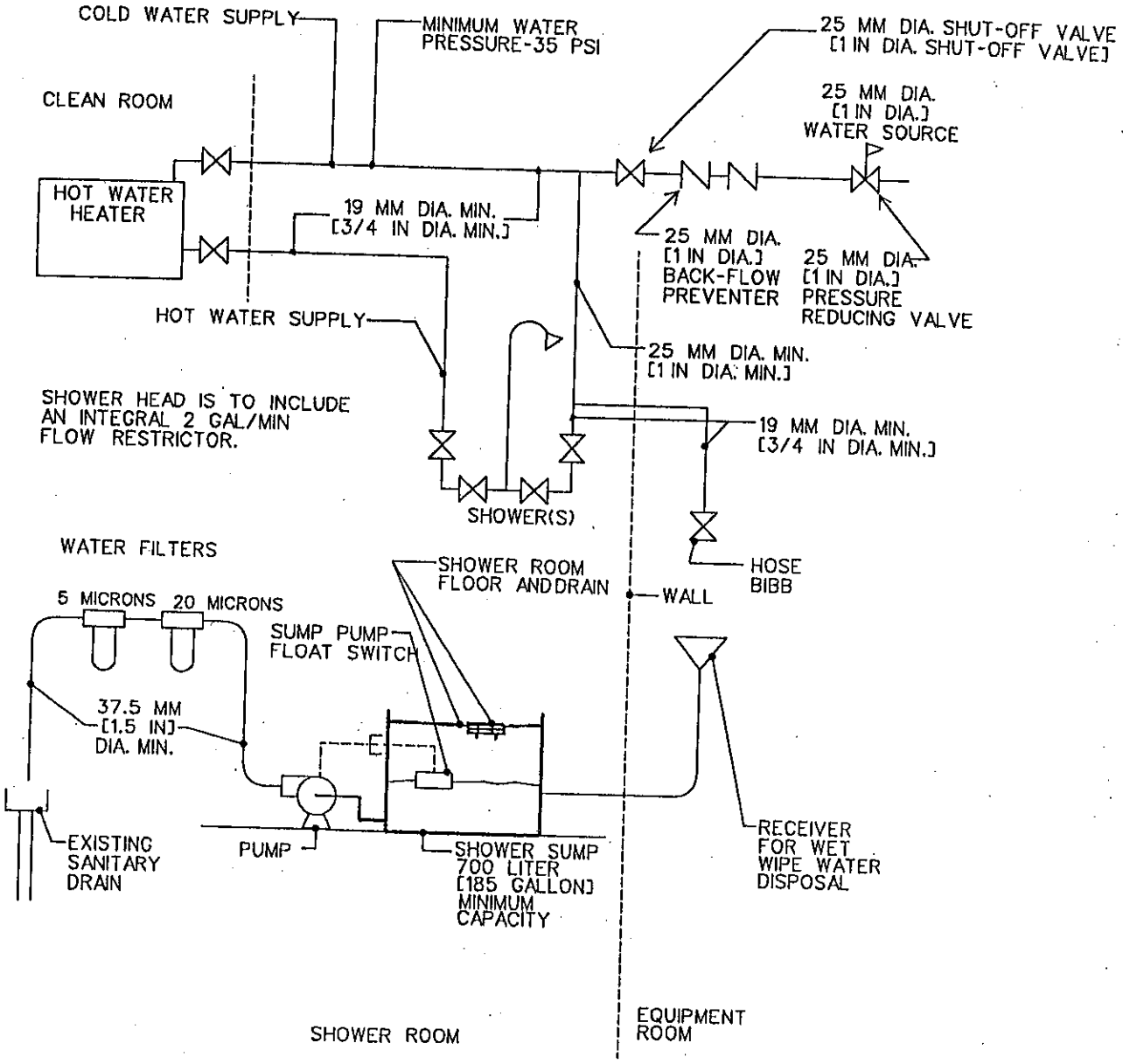
- Vacuum clothing and shoes outside equipment room.
- Remove all clothing and equipment (except respirator) in equipment room.
- Store work shoes and equipment in locker.
- With respirator still on, shower thoroughly, including hair. Then remove respirator and finish shower.
- Proceed to clean room and put on street clothes.

3. See sheet 23 for minimum plumbing requirements, including wastewater filtration. Ensure that plumbing and specified filter size meet local requirements.

4. Twice daily, or more often if necessary, and before breaking down decontamination unit after abatement, adequately wet clean and HEPA vacuum all wall, floor, equipment, and other surfaces. Waste collected in shower room and equipment room shall be treated as asbestos-contaminated material. Place in approved container; see sheet 9. Apply labels; see sheet 14.

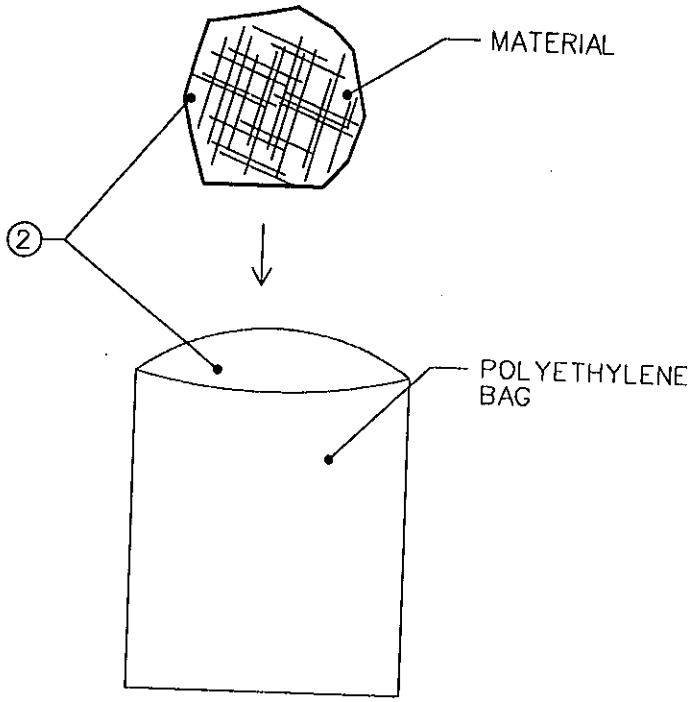
5. Prepare for final clearance.

**Final clearance requirements.** Contractor and Contracting Officer will certify visual inspection of work area on sheet 19, *Certification of Final Cleaning and Visual Inspection*. Contract designee(s) will conduct final air clearance monitoring as required by the contract. If the unit is not a prefabricated decontamination unit, apply lockdown encapsulant before final air clearance monitoring. After approval of final air clearance, break down and treat polyethylene as asbestos contaminated material. Place in approved container; see sheet 9. Apply labels; see sheet 14. Dispose of as required by the contract.




SIZE CAPACITY OF SUMP PUMP FOR TWICE THE EXPECTED WASTE WATER FLOW.

**Decontamination unit piping details**




## Removal of miscellaneous asbestos-containing materials

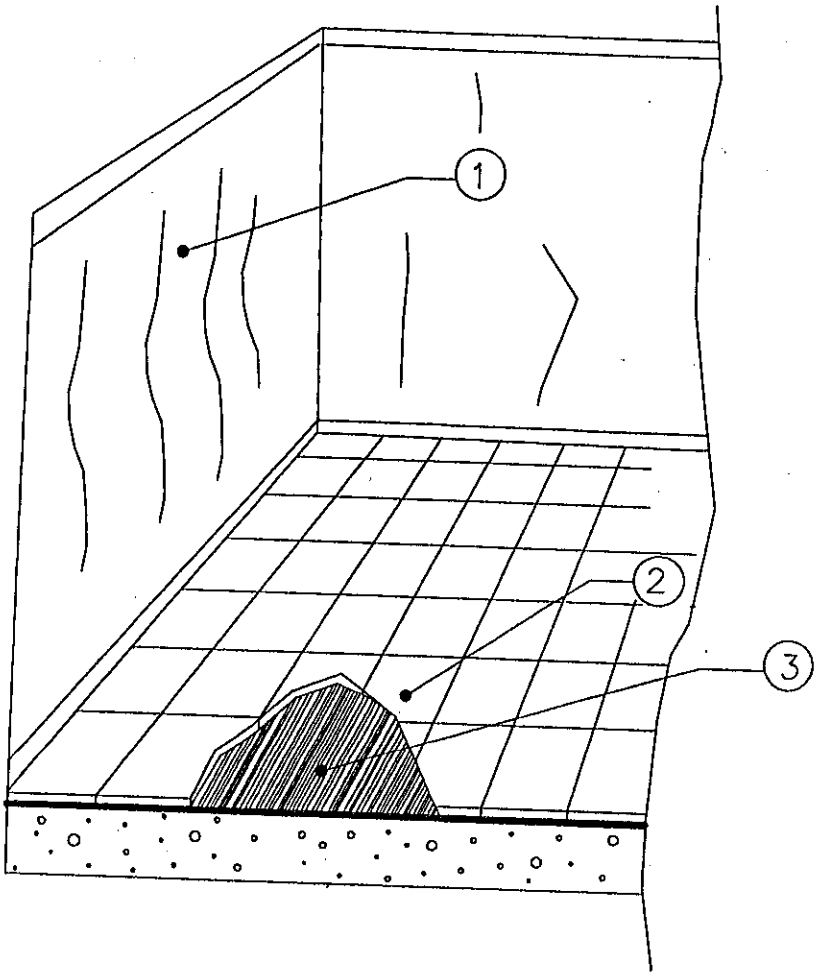
1. Establish work area so that unauthorized entry is prevented; see sheet 11. Prepare containment area as specified on sheet 21.

2. Adequately wet mist materials with amended water. Remove and place in approved container; see sheet 9. Apply labels; see sheet 14.

3. HEPA vacuum and wet wipe area in the immediate vicinity of removed materials.

4. Prepare area for final clearance.

5. Carry out final clearance requirements as specified on sheet 21.




## Removal of vinyl asbestos tile adhered to concrete floor system by asbestos-containing adhesive

1. Prepare containment area as specified on sheet 21. NOTE: Where full containment area is required, follow instructions on sheet 4, except omit polyethylene on floor.

2. Lightly flood asbestos tile with amended water, and let soak for 48 hours. Remove asbestos tile and adhesive while they are wet in order to prevent asbestos fiber release. Place tile and adhesive into an approved container; see sheet 9. Apply labels; see sheet 14.

3. Clean, HEPA vacuum, and wet wipe all surfaces.

4. Inspect and reclean area as necessary.

5. Prepare area for final air clearance.

6. Carry out final clearance requirements as specified on applicable sheet 18 or 21.

ATTACHMENT 17

# UFGS SECTION 13281A LEAD HAZARD CONTROL ACTIVITIES

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DIVISION 13 - SPECIAL CONSTRUCTION

SECTION 13281A

LEAD HAZARD CONTROL ACTIVITIES

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# SECTION 13281A

# LEAD HAZARD CONTROL ACTIVITIES

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM E 1553 | (1993) Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities |
| ASTM E 1613 | (1999) Standard Test Method for Determination of Lead by Inductivety Coupled Plasma Atomic Emission Spectrometry (ICP-AES), Flame Atomic Absorption Spectrometry (FAAS), or Graphite Furnace Atomic Absortion (GFAAS) Techniques |
| ASTM E 1726 | (1995) Sample Digestion of Soils for the Determination of Lead by Atomic Spectrometry |
| ASTM E 1727 | (1999) Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques |
| ASTM E 1741 | (2000) Preparaton of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities for Subsequent Analysis by Atomic Spectrometry |

HAWAII OCCUPATIONAL SAFETY AND HEALTH (HIOSH)

| | |
|---|---|
| HIOSH 12-148 | Lead |

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

| | |
|---|---|
| NFPA 701 | (1999) Methods of Fire Tests for Flame-Resistant Textiles and Films |

NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH (NIOSH)

| | |
|---|---|
| NIOSH Pub No. 84-100 | (1984; Supple 1985, 1987, 1988 & 1990) NIOSH Manual of Analytical Methods |

U.S. ARMY CORPS OF ENGINEERS (USACE)

| | |
|---|---|
| EM 385-1-1 | (1996) U.S. Army Corps of Engineers Safety and Health Requirements Manual |

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)

| | |
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| EPA 747-K-99-001 | (1999) Protect Your Family From Lead in Your Home |

U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

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| 24 CFR 35 | Lead-Based Paint Poisioning Prevention in Certain Residential Structures |
| 29 CFR 1910 | Occupational Safety and Health Standards |
| 29 CFR 1926 | Safety and Health Regulations for Construction |
| 40 CFR 745 | Lead-Based Paint Poisoning Prevention in Certain Residential Structures |

## 1.2 DEFINITIONS

a. Lead Hazard Control Activity - Any construction work where a worker may be occupationally exposed to lead and procedures have to be followed to assure that: 1). Lead inside the lead hazard control area is cleaned up to appropriate levels and 2). Lead dust does not disperse outside the lead hazard control area at unacceptable levels.

b. Public/Commercial Building - Buildings on real property, including residential real property, generally accessible to the public except target housing, child occupied facilities and industrial buildings. Examples include offices, stores/shopping centers, churches, schools, barracks, hospitals, museums, airports, hotels, convention centers.

## 1.3 DESCRIPTION OF WORK

The work covered by this section includes work tasks, on the individual work task data sheets at the end of this section, and the precautions specified in this section for the protection of workers, building occupants and the environments.

The Contractor shall be responsible to remove any loose and flaking paint on horizontal and vertical surfaces that will remain inplace. The Contractor will be responsible to encapsulate areas of removal.

### 1.3.1 Protection of Existing Areas To Remain

All project work including, but not limited to, lead hazard work, storage, transportation, and disposal shall be performed without damaging or contaminating adjacent work and areas. Where such work or areas are damaged or contaminated, the Contractor shall restore work and areas to the original condition at no additional cost to the Government.

### 1.3.2 Coordination with Other Work

The contractor shall coordinate lead hazard control activities with work being performed in adjacent areas. Coordination procedures shall be explained in the Contractor's Accident Prevention Plan and shall describe how the Contractor will prevent lead exposure to other contractors and/or Government personnel performing work unrelated to lead hazard control activities.

## 1.4 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Materials and Equipment
Expendable Supplies

A description of the materials, equipment and expendable supplies required; including Material Safety Data Sheets (MSDSs) for material brought onsite to perform the work.

Qualifications; G

A report providing evidence of qualifications and designating responsibilities for personnel and laboratories.

SD-06 Test Reports

Pressure Differential Log
Licences, Permits, and Notifications; G
Accident Prevention Plan (APP); G

A report describing how the Contractor will protect workers, building occupants, and building contents while performing lead hazard control activities; and how project clearance will be performed.

Sampling and Analysis; G

A log of the analytical results required for the sampling. The log shall be kept current.

Clearance Report; G

Report prepared by the QSHP.

## 1.5 QUALIFICATIONS

### 1.5.1 Qualifications and Organization Report

The Contractor shall furnish a qualification and organization report. The report shall describe the qualifications of the qualified safety and health professional (QSHP), onsite safety and health supervisor (OSHS), labor staff and the independent risk assessor. The report shall include an organization chart showing the Contractor's personnel by name and title and

project specific responsibilities and authorities. The report shall describe the qualifications of the laboratories selected for this project. The report shall be signed by the Contractor and the qualified safety and health professional to indicate that all personnel and laboratories comply with certification and experience requirements of this section and that project personnel have been given the authority to complete the tasks assigned to them.

1.5.2 Personnel and Subcontractor Responsibilities and Qualifications

1.5.2.1 Qualified Safety and Health Professional (QSHP)

The QSHP shall be responsible for development of project specific requirements in the Accident Prevention Plan (APP); supervise implementation of the APP requirements; visit the site as needed to verify effectiveness of the APP and to coordinate resolution of unknown situations that may develop as the work progresses; be available to provide consultation to the Onsite Safety and Health Supervisor (OSHS); review sampling and analytical results to evaluate occupational exposure levels, verify effectiveness of controls and determine if clearance requirements have been met. The QSHP shall have demonstrable experience with the implementation of occupational safety and health regulations.

1.5.2.2 Lead Hazard Control Workers

Lead Hazard Control workers shall be responsible for performing the labor necessary to complete the lead hazard control activities required in this contract.

1.5.2.3 Independent Certified Risk Assessor

The independent Certified Risk Assessor shall be a subcontractor to the prime Contractor on the project. The risk assessor shall be responsible to perform the sampling and evaluating the analytical data to verify clearance levels have been achieved. The independent risk assessor shall sign the clearance report indicating clearance requirements for the contract have been met.

1.5.2.4 Testing Laboratories

The laboratory selected to perform analysis on paint chip, soil or dust wipe samples shall be accredited by EPA's National Lead Laboratory Accreditation Program (NLLAP). The laboratory selected perform analysis on worker exposure (industrial hygiene) samples shall be in the American Industrial Hygiene Association's Industrial Hygiene Laboratory Accreditation Program (IHLAP) and shall be successfully participating in the Proficiency Analytical Testing (PAT) program for lead.

1.5.2.5 Blood Lead Testing

The laboratory selected to perform analysis on worker blood samples shall be approved by OSHA and meet the requirements contained in http://www.osha-slc.gov/OCIS/toc_bloodlead.html.

1.5.2.6 Disposal Facility and Transporter

The Contractor shall furnish written evidence that the landfill to be used is approved for lead disposal by USEPA and state and local requirements. Copies of any required signed agreements between the Contractor (including

subcontractors and transporters) and the lead disposal facility shall be provided.

## 1.6 REGULATORY REQUIREMENTS

In addition to the detailed requirements of this specification, work shall be performed in accordance with requirements of EM 385-1-1 and applicable regulations including, but not limited to 29 CFR 1910, 29 CFR 1926, especially Section .62, and the accepted Accident Prevention Plan with Appendices. Matters of interpretation of the standards shall be resolved to the satisfaction of and with the concurrence of, the Contracting Officer before starting work. Where these requirements vary, the most stringent shall apply. The following State and local statutes, regulations and requirements apply to lead hazard control activities to be performed: State, HIOSH 12-148.

## 1.7 ACCIDENT PREVENTION PLAN (APP)

### 1.7.1 APP Content and Organization

The Contractor's Accident Prevention Plan shall be organized into 5 parts, consisting of the overall plan and 4 appendices. The overall plan shall address each element in Appendix A of EM 385-1-1 in project specific detail. The elements are: a. Signature Sheet, b. Background Information, c. Statement of Safety and Health Policy, d. Responsibilities and Lines of Authorities, e. Subcontractors and Suppliers, f. Training, g. Safety and Health Inspections, h. Safety and Health Expectations, Incentive Programs and Compliance, i. Accident Reporting, j. Medical Support, k. Corporate Plans and Programs required by this contract, (HAZCOM, Respiratory Protection).

#### 1.7.1.1 Lead Hazard Control Plan Appendix

The Lead Hazard Control Appendix shall address occupational exposure issues and shall describe the procedures to be followed to protect employees from lead hazards while performing lead hazard control activities. Each of the following elements shall be addressed in the lead hazard control appendix:

a. The location and a brief description of each work activity that will emit lead into the workplace atmosphere. A description of any components containing lead shall be included and keyed to the project drawings.

b. Description of equipment and materials, controls, crew size, worker responsibilities, and operating and maintenance procedures.

c. Description and sketch of the Lead Hazard Control Areas, including decontamination areas.

d. Description of the specific lead control methods and procedures to protect workers and other onsite contractors from lead exposure.

e. Technologic equipment used to keep occupational exposure below the Permissible Exposure Limit and minimize worker exposure to lead (i.e., HEPA-filtered vacuum equipment/cleaners, special negative air enclosure equipment and supplies, etc.).

f. Worker Exposure Assessment including methods and procedures to monitor and document worker exposure to lead. Worker exposure

monitoring shall be broken into two parts in the plan. Part A: Initial Determination. The Contractor shall describe worker monitoring (if performed for the "initial determination" described in 29 CFR 1926 (.62) (d). Monitoring for the initial determination may be omitted from the plan if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The Contractor shall substitute objective proof of action level compliance in Part A if "initial determination" monitoring is omitted. Part B: Continued Exposure Monitoring. Worker exposure monitoring after the initial lead exposure determination has been made.

g. Work Practices Program describing the protective clothing to be used to protect workers from lead exposure, house keeping procedures employed to minimize spread on lead contamination in the lead hazard control area, hygiene facilities and practices used to prevent workers from inadvertent ingestion of lead.

h. Administrative Control Procedures, to be used as a last resort, to limit worker exposure to lead. The worker rotation schedule to be employed, should engineering or personal protective equipment precautions fail to be effective, shall be described. This element of the plan shall be omitted if administrative controls will not be used.

i. Medical Surveillance practices and procedures used to monitor worker exposure to lead and to assure fitness for wearing respiratory protection devices.

j. Worker training meeting the requirements of 29 CFR 1926 Sections (.62) and (.59) to assure workers understand hazard associated with working with lead and how to protect themselves.

k. Security: The Contractor shall demarcate work area with caution tape. The Contractor will have sole control on entry and exit from work site for each lead hazard control area. A log book shall be kept documenting entry into and out of the lead hazard control area. Entry into lead hazard control areas shall only be by personnel authorized by the Contractor and the Contracting Officer. Persons entering control areas shall be trained, medically evaluated, and equipped with personal protective equipment required for the specific control area to be entered.

1.7.1.2 Activity Hazard Analyses Appendix

An Activity Hazard Analysis (AHA) shall be prepared for each work task data element specified on the individual work task data element sheets at the end of this section. The AHA shall be submitted to the Contracting Officer prior to beginning specified work. Format shall be in accordance with EM 385-1-1, figure 1-1. The AHA shall be continuously reviewed and modified, when appropriate, to address changing conditions or operations. Each accepted AHA shall be appended to and become part of the APP.

1.7.1.3 Clearance Plan Appendix

The Contractor shall develop a Clearance Plan describing practices and procedures used to assure that lead hazard control activities are complete and that lead contamination within the lead hazard control area comply with

final clearance levels or visual clearance criteria. Sampling and analysis procedures used to document project completion and clearance goals shall be explained in the Clearance Plan Appendix.

1.7.2 Lead Hazard Information Pamphlet Distribution

Prior to commencing lead hazard control activities, the Contractor shall provide owners/occupants who are affected by the project as defined in 40 CFR 745.Subpart E, the EPA 747-K-99-001. The pamphlet shall be provided in compliance with 40 CFR 745 (.80) through 40 CFR 745 (.88). The Contractor shall collect signatures from affected residents acknowledging they have been informed of planned lead hazard control activities.

1.8 PRE-CONSTRUCTION SAFETY CONFERENCE

1.8.1 Conference General Requirements

The Contractor and the QSHP shall attend a pre-construction safety conference prior to starting work. Items required to be submitted shall be reviewed for completeness, and where specified, for acceptance. Details of the APP shall be revised to correct any deficiencies, and resubmitted for acceptance. Onsite work shall not begin until the APP has been accepted, unless otherwise authorized by the Contracting Officer. One copy of the APP shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to personnel on the site. As work proceeds, the APP shall be adapted to new situations and conditions. Changes to the APP shall be made by the QSHP with acceptance by the Contracting Officer. Should an unforeseen hazard become evident during performance of the work, the QSHP shall inform the Contracting Officer, both verbally and in writing, for immediate resolution. In the interim, the QSHP shall take necessary action to re-establish and maintain safe working conditions; and to safeguard onsite personnel, visitors, the public, and the environment. Disregard for provisions of this specification, or the accepted APP, shall be cause for stopping of work until the matter is rectified.

1.8.2 Preparatory Inspection Meeting

The Contractor shall arrange and hold a preparatory inspection meeting to review completeness and adequacy of the APP immediately prior to beginning each phase of work.

1.9 MEDICAL SURVEILLANCE REQUIREMENTS

The Contractor shall comply with the following medical surveillance requirements:

a. The Contractor shall make every attempt to keep occupational exposure to lead on this project below the action level of 30 micrograms/cubic meter defined in 29 CFR 1926 (.62). If it is not possible, and if occupational exposures could possibly exceed the action level for 30 or more days per year, the Contractor shall institute a medical surveillance program. The program shall meet the examination frequency and content requirements specified in paragraph (j)(1), (j)(2) and (j)(3) of 29 CFR 1926 (.62). Medical removal as specified in paragraph (k) of 29 CFR 1926 (.62), if necessary, shall be at the Contractor's expense.

b. Medical surveillance and biological monitoring shall be in

compliance with 29 CFR 1926 (.62) (g) and (j). Initial biological monitoring shall be performed on lead hazard control workers prior to assignment to the project. Workers shall not be assigned to the project if results indicate a need for restricted activities.

c. All lead hazard control workers shall pass the medical examinations necessary to be approved by the occupational physician to wear respiratory protection on this project. Occupational physician's approval shall be given prior to assignment to the project.

## 1.10 RESPIRATORY PROTECTION PROGRAM

The Contractor shall have a written respiratory protection program and shall be fully capable of implementing the requirement of the respiratory protection program on this project. The respiratory protection program shall meet the requirements of 29 CFR 1926 (.62) and 29 CFR 1910 (.134). Project specific respiratory protection requirements shall be included in the lead hazard control plan appendix of the Contractor's accident prevention plan.

## 1.11 LICENCES, PERMITS AND NOTIFICATIONS

The Contractor shall certify in writing to the Regional Office of the EPA state's environmental protection agency responsible for lead hazard activities and the Contracting Officer at least 10 days prior to the commencement of work that licenses, permits and notifications have been obtained. The Contractor is responsible for all associated fees or costs incurred in obtaining the licenses, permits and notifications.

## 1.12 TRAINING

### 1.12.1 OSHA Training Requirements

All Contractor personnel and/or subcontractors performing or responsible for onsite oversight of lead hazard control activities shall meet the following training requirements.

a. Content of 29 CFR 1926 (.62) and its appendices.

b. How operations could result in exposure over the action level.

c. Purpose, selection, fitting, use and limitations of respirators.

d. Purpose and description of the medical surveillance program.

e. Use of engineering controls and good work practices to limit occupational exposure to lead.

f. Implementation of the lead hazard control plan appendix of the accident prevention plan.

g. Medical supervision for the use of chelating agents.

h. Employee right of access to medical surveillance records as specified in 29 CFR 1910 (.20).

### 1.12.2 Qualified Safety and Health Professional

The qualified safety and health professional shall meet the training requirements in paragraph 1.12.1 and shall meet the training, experience and authority requirements in 29 CFR 1926 (.62) to be a competent person and be trained and have the experience and education to meet 40 CFR 745 Subpart L requirements to carry the following certifications:

a. Certified Risk Assessor
b. Certified Project Designer
c. Certified Supervisor

1.12.3 Independent Risk Assessor

The independent risk assessor shall meet the training requirements in paragraph OSHA Training Requirements, above, and shall meet the training and experience requirements in40 CFR 745 to carry certification as a certified risk assessor.

1.12.4 Abatement Worker

Workers shall meet the OSHA Training Requirements specified above and the training requirements in 40 CFR 745 Subpart L to carry certification as a Certified Worker, if required.

1.12.5 Training Program Certification

Training to meet 40 CFR 745 Subpart L requirements shall be provided by an EPA accredited training provider and the Contractor shall provide proof in the Qualifications and Organization Report showing that personnel have passed certification examinations for their respective disciplines, that fees for certification have been paid to the EPA (or to the state for state-run programs) and that EPA has certified the QSHP, independent risk assessor, certified workers to perform their duties.

1.13 ANALYSIS

The assumption due to the age of the building is that all painted surfaces contain lead.

1.13.1 Analytical Procedures

1.13.1.1 Analysis Methods

Analysis shall conform to NIOSH Pub No. 84-100 Method 7082, Lead, for personal sampling required by 29 CFR 1926 (.62), ASTM E 1613. Sampling shall conform to ASTM E 1553 and ASTM E 1741.

1.13.1.2 Paint Chip Sampling and Analysis

Analysis shall conform to ASTM E 1613.

1.13.1.3 Dust Wipe Materials, Sampling and Analysis

Analysis shall conform to ASTM E 1613.

1.13.1.4 Soil Sampling and Analysis

Sampling shall conform to ASTM E 1727, ASTM E 1726, Analysis shall conform to ASTM E 1613.

1.13.2 Occupational Exposure Assessment

Sampling and analytical procedures to determine compliance with the occupational exposure monitoring requirement of this section shall be described in the lead hazard control plan appendix of the Contractor's accident prevention plan. Monitoring for the initial determination may be omitted if the Contractor has sufficient proof from previous operations as specified in 29 CFR 1926 (.62) (d)(3)(iii) and (iv) that workers will not be exposed over the action level. The following occupational exposure monitoring requirements apply and shall be implemented if the requirements of 29 CFR 1926 (.62)(d)(3) (iii) and (iv) cannot be demonstrated.

a. During Initial Monitoring the Contractor shall representatively sample employees with the greatest potential for exposure to aerosolized lead.

b. Continued/Additional Monitoring shall meet applicable paragraphs in 29 CFR 1926 (.62)(d)(6), Frequency, after the initial determination has been made.

1.13.3 Lead Hazard Control Area/Containment Monitoring

The Contractor shall perform a visual inspection once per day outside the lead hazard control area to assure visual clearance criteria are maintained while lead hazard control activities are performed. The Contractor shall clean at its own expense, and to the Contracting Officer's satisfaction, all contaminated surfaces outside the lead hazard control area, if surfaces fail visual clearance criteria.

1.13.4 Occupancy During Work

The Contractor shall wipe sample a floor surface at a location no more than 10 feet outside the lead hazard control area at a frequency of once per day while lead hazard control activities are being performed. Wipe sampling analytical results shall pass clearance criteria for floors specified in this contract. The Contractor shall clean all contaminated surfaces at its own expense and to the Contracting Officer's satisfaction, if floor wipe samples required in this paragraph fail clearance criteria.

1.13.5 Clearance Monitoring

Sampling and analytical procedures to determine the clearance requirements of this section shall be described by the Contractor in the Clearance Plan Appendix of the Accident Prevention Plan. The Contractor shall perform the following sampling and analysis to verify that clearance requirements for the contract (inside the lead hazard control) area have been met.

a. The Contractor shall take dust wipe samples inside the lead hazard control area after the final visual inspection in the quantities and at the locations specified.

   (1) Floors 3 per floor.

b. The Contractor shall take exterior bare soil samples inside the lead hazard control area after the final visual inspection in the quantities and at the locations specified.

   (1) Near the building foundation 1 composite sample/building.

1.13.6 Waste Disposal Sampling

The Contractor shall sample the following waste streams for TCLP analysis to determine waste disposal requirements.

a. The Contractor shall take 1 TCLP samples of building demolition debris/per building..

b. The Contractor shall take 1 TCLP samples of paint chips/per building.

c. The Contractor shall take 1 compsite samples of soil.

1.13.7 Analytical Results

The Contractor shall develop and maintain during the course of the project a log of analytical results generated by the above sampling requirements. The log shall clearly describe the reason for which the sample was taken (worker exposure, migration control, clearance) the analytical result for each sample and evaluate if the analytical result passed or failed the action levels. At a minimum, the Contractor shall include analytical results for samples required to be taken in paragraphs Occupational Exposure Assessment, Lead Hazard Control Area/Containment Monitoring, Occupancy During Work, and Clearance Monitoring specified above.

1.14 CLEARANCE REQUIREMENTS

The Contractor shall describe clearance requirements for this project in the Clearance Plan Appendix of the Accident Prevention Plan.

a. Clearance levels inside lead hazard control area, public and commercial buildings:

(1) Floors 100.
(2) Bare soils 2000 mg/kg.

1.15 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The Contractor shall describe the PPE to be used to protect workers from lead hazards in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall furnish, at no cost to the workers, clothing for protection from lead-contaminated dust and debris. An adequate supply of these items shall be available for worker and Government personnel use. Protective clothing shall include:

a. Coveralls : Full-body moisture permeable (breathable)disposable coveralls shall be provided to lead hazard control workers.

b. Boots: Boots and shoes shall be provided as required by EM 385-1-1 Section 05.A.08 for workers. Boot/shoe covers shall be provided to prevent contamination of boots and shoes.

c. Hand Protection: Gloves, etc., shall be provided as required by EM 385-1-1 Section 05.A.10 for workers.

d. Head Protection: Hard hats shall be provided as required by 29 CFR 1910 (.135) and EM 385-1-1 Section 05.D for workers and authorized visitors.

e. Eye and Face Protection: Eye and face protection shall be provided as required by 29 CFR 1910 (.133) and EM 385-1-1 Section 05.B for workers and authorized visitors.

f. Respirators: NIOSH certified air-purifying respirators or filtering face pieces shall be provided for use as respiratory protection for airborne lead and for other hazardous airborne contaminants that may be encountered; as determine by the on-site safety and health supervisor. At a minimum, respirators shall be furnished to each employee required to enter a lead hazard control area where an employee exposure assessment has not yet been performed, or where monitoring data establishes the need for respiratory protection, or if requested by the employee.

g. Respirator Cartridges/Filtering Face Pieces: Respirator cartridges shall be changed out/filtering face pieces properly disposed of when the they become sufficiently loaded with particulate matter that workers experience breathing resistance. Cartridges and filtering face pieces shall be N, R or P 100 rated to assure sufficient protection from lead exposure.

## 1.16 HYGIENE FACILITIES

The Contractor shall describe the personal hygiene facilities to be used by the workers in the Lead Hazard Control Plan Appendix of the Accident Prevention Plan. The Contractor shall provide hygiene facilities for lead hazard control workers. Hygiene facilities shall consist of the following:

### 1.16.1 Hand Wash Stations

The Contractor shall provide hand washing facilities for use by lead hazard control workers. Hand washing facilities shall comply with the requirements in 29 CFR 1926 (.51) (f). Faces and hands shall be washed when leaving the lead hazard control area and after each work-shift if showers are not provided.

### 1.16.2 Change Area

The Contractor shall provide a change area to workers. The change area shall be equipped so that contaminated work clothing and street clothes shall be stored separately to prevent cross contamination.

### 1.16.3 Showers

Showers shall be provided if feasible and if worker exposures exceed the PEL. When provided, showers facilities shall meet the requirements of 29 CFR 1926 (.51) (f).

### 1.16.4 Eating Area

The Contractor shall set aside an area or provide a room for taking breaks and eating lunch. This area shall be kept as free as practicable from lead contamination. Workers shall be required to follow the procedures in 29 CFR 1926 (.62) (i)(4) when using the room.

## 1.17 POSTED WARNINGS AND NOTICES

The following regulations, warnings, and notices shall be posted at the worksite in accordance with 29 CFR 1926 (.62).

1.17.1 Regulations

At least two copies of 29 CFR 1926 (.62) shall be made available for use by either the Contracting Officer or affected workers; and for the purpose of providing required information and training to the workers involved in the project. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to workers on the site.

1.17.2 Warning Signs and Labels

Warning signs shall be posted in each lead hazard control area where worker exposure to lead is undetermined or where the exposures are above the permissible exposure limit as defined in 29 CFR 1926 (.62). Signs shall be located to allow personnel to read the signs and take necessary precautions before entering the lead hazard control area.

1.17.2.1 Warning Signs

Warning signs shall be in English be of sufficient size to be clearly legible, and display the following:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

1.17.2.2 Warning Labels

Warning labels shall be affixed to all lead waste disposal containers used to hold materials, debris and other products contaminated with lead hazards; warning labels shall be in English and be of sufficient size to be clearly legible, and display the following:

CAUTION: CLOTHING CONTAMINATED WITH LEAD. DO NOT REMOVE DUST BY

BLOWING OR SHAKING. DISPOSE OF LEAD CONTAMINATED WASH WATER IN

ACCORDANCE WITH APPLICABLE FEDERAL, STATE OR LOCAL REGULATIONS.

1.17.3 Worker Information

Right-to-know notices shall be placed in clearly visible areas accessible to personnel on the site, to comply with Federal, state, and local regulations.

1.17.4 Air Monitoring Results

Air monitoring results shall be prepared so as to be easily understood by the workers. One copy shall be maintained in the Contractor's jobsite file, and a second copy shall be posted where it will be accessible to the workers as specified in 29 CFR 1926 (.62).

1.17.5 Emergency Telephone Numbers

A list of emergency telephone numbers shall be posted at the site. The list shall include numbers of the local hospital, emergency squad, police and fire departments, Government and Contractor representatives who can be

reached 24 hours per day, and professional consultants directly involved in the project.

1.18 MATERIALS AND EQUIPMENT

Sufficient quantities of health and safety materials required by 29 CFR 1926 (.62), and other materials and equipment needed to complete the project, shall be available and kept on the site.

1.18.1 Abrasive Removal Equipment

The use of powered machine for vibrating, sanding, grinding, or abrasive blasting is prohibited unless equipped with local exhaust ventilation systems equipped with high efficiency particulate air (HEPA) filters.

1.18.2 Negative Air Pressure System

1.18.3 Vacuum Systems

Vacuum systems shall be suitably sized for the project, and filters shall be capable of trapping and retaining all mono-disperse particles as small as 0.3 micrometers at a minimum efficiency of 99.97 percent. Used filters that are being replaced shall be disposed in a proper manner.

1.19 EXPENDABLE SUPPLIES

1.19.1 Polyethylene Bags

Disposable bags shall be polyethylene plastic and shall be a minimum of 6 mils thick (4 mils thick if double bags are used) or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be capable of being made leak-tight. Leak-tight means that solids, liquids or dust cannot escape or spill out.

1.19.2 Polyethylene Sheeting

Sheeting shall be polyethylene plastic with a minimum thickness of 6 mil, or any other thick plastic material shown to demonstrate at least equivalent performance; and shall be provided in the largest sheet size reasonably accommodated by the project to minimize the number of seams. Where the project location constitutes an out of the ordinary potential for fire, or where unusual fire hazards cannot be eliminated, flame-resistant polyethylene sheets which conform to the requirements of NFPA 701 shall be provided.

1.19.3 Tape and Adhesive Spray

Tape and adhesive shall be capable of sealing joints between polyethylene sheets and for attachment of polyethylene sheets to adjacent surfaces. After dry application, tape or adhesive shall retain adhesion when exposed to wet conditions, including amended water. Tape shall be minimum 2 inches wide, industrial strength.

1.19.4 Containers

When used, containers shall be leak-tight and shall be labeled in accordance with EPA, DOT and OSHA standards, as specified in paragraph WARNING LABELS.

1.20 STORAGE OF MATERIALS

Materials shall be stored protected from damage and contamination. Flammable or hazardous materials shall not be stored inside a building. Materials shall be regularly inspected to identify damaged or deteriorating items. Damaged or deteriorated items shall not be used and shall be removed from the site as soon as they are discovered. Stored materials shall not present a hazard or an inconvenience to workers, visitors, and/or other occupants and employees of the facility in which they are located.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 WORK PROCEDURES

The Contractor shall perform work following practices and procedures described accident prevention plan.

3.1.1 Lead Hazard Control Areas, Equipment and Procedures

The Contractor shall set up lead hazard control areas and operate equipment within the lead hazard control area in a manner that will minimize migration of lead dust beyond the lead hazard control area boundaries and minimize exposure to workers.

3.1.2 Lead Hazard Control Areas

Access into lead hazard control areas by the general public shall be prohibited. Workers entering the lead hazard control area shall meet medical surveillance requirements of this contract and shall be required to understand and follow procedures described in the Contractor's accident prevention plan for reducing lead exposure. Lead hazard control area preparation and restriction requirements follow:

a. Containment features for interior lead hazard control projects: Polyethylene sheeting sealed with spray adhesive and duct tape and Colored caution tape to designate the lead hazard control area. The floor in the lead hazard control area shall be covered with two layers of polyethylene sheeting. The entry/exit shall be sealed with a primitive air lock. Openings, such as HVAC supply and return air vents, into the lead hazard control area shall be sealed with polyethylene sheeting and duct tape or with sealed rigid coverings.

b. Containment features for exterior lead hazard control projects: Plastic sheeting, Colored caution tape, A roped-off boundary perimeter, using caution tape or a barrier installed at 25 feet distance from where the lead control work is performed.

3.2 USE OF HYGIENE FACILITIES

a. Personnel and equipment shall be decontaminated when exiting the lead hazard control area. The Contractor shall comply with the following personnel and equipment decontamination procedures:

(1) HEPA vacuum outer garments and equipment.
(2) Wet Wipe Equipment.
(3) Remover outer layer of garments.

(4) Thoroughly wash face and hands, if showering not required.
(5) Shower (if applicable).
(6) Remove Respirator (if applicable).
(7) Exit lead hazard control area.

b. The Contractor shall provide, and workers shall use, a change room to change into work clothing at the beginning of a work shift. At the end of the work shift workers shall change back into street clothing and leave contaminated work clothing at the site for disposal or laundering.

c. The Contractor shall provide an eating facility as free as practical from lead contamination. Workers shall be allowed usage of the eating facility for rest/lunch breaks.

## 3.3 WASTE DISPOSAL PROCEDURES

### 3.3.1 Construction Debris and/or Sanitary Landfill Waste

The Contractor shall dispose of the following waste streams in a construction debris, sanitary landfill: Building Demolition Debris, Used Personal Protective Equipment, Disposable material from containment structures.

### 3.3.2 Waste Stream Classification

Quad C is exempt from hazardous waste regulations since it is used as a military barracks. The landfill will require a profile (TCLP) on the demolition debris and paint chips collected for their records. If paint chips are collected, the landfill requests that the chips are double bagged in 6 mil poly bags.

### 3.3.3 RCRA Subtitle C Hazardous Waste

Since Quad c is a military barracks, it will be exempt from hazardous wasted disposal regulations. The waste from this project is considered residential waste. The landfill will require TCLP Tests, one for demo and paint chip debris for their records.

## 3.4 LEAD HAZARD CONTROL PROCEDURES, METHODS AND TECHNIQUES.

### 3.4.1 Paint Removal Methods

Prohibited paint removal methods shall include: open flame burning or torching, including the use of heat guns having operating temperatures greater than 1,100 degrees F; machine sanding or grinding without HEPA exhaust; non-contained hydro blasting or high-pressure water wash; abrasive blasting or sandblasting without HEPA exhaust; dry scraping, except near electrical outlets or when using a heat gun. Chemical paint removers containing methylene chloride are prohibited. Building components and structures adjacent to the removal process shall be appropriately protected from damage due to the removal process employed. Stripping shall be done according to manufacturer's recommendations. Stripped substrates shall be thoroughly washed and neutralized before applying a primer or sealing coat.

#### 3.4.1.1 Wet Scraping

Surfaces near electrical outlets shall not be moistened but shall be dry scraped only. Loose material shall be scraped from the surface and

deposited onto the containment plastic. Damp scrapings shall be cleaned up as soon as possible to prevent tracking throughout the work area. Scraper blades shall be kept sharp. Additional scraper blades shall be supplied and shall be selected for the type of surface being scraped.

## 3.5 CLEARANCE PROCEDURES

### 3.5.1 Visual Inspection

QSHP shall perform a visual inspection, using the form at the end of this section, for each lead hazard control area to assure that lead hazard control activities, identified in the individual work task data elements, have been properly completed. The QSHP shall visually verify that lead hazards have been removed, control technology has been appropriately applied/installed and that the lead hazard control area is free of dust and paint chips generated by lead hazard control activities.

### 3.5.2 Analytical Demonstration of Clearance

After the visual inspection the independent risk assessor shall take clearance samples for laboratory analysis to verify clearance requirements specified in paragraph CLEARANCE REQUIREMENTS have been met.

## 3.6 EVALUATION OF SAMPLING AND MONITORING RESULTS

Analytical results from samples taken during lead hazard control activities shall be evaluated to determine compliance with occupational safety and health standards and project specific control efficiency and clearance/clean up levels.

### 3.6.1 Occupational Safety and Health

The QSHP shall review the analytical results from samples taken for the initial exposure assessment and continued occupational safety and health monitoring if required. Effectiveness and adequacy of personal protective equipment, respirators, work practices, hygiene facilities and personal decontamination procedures shall be evaluated and upgrades/downgrades in equipment and procedures made. After notifying the Contracting Officer the following shall be applied:

a. Exposures over the PEL (0.05 mg/cubic meter):

(1) Improve work practices to reduce exposures.

(2) Don respirators.

(3) Assure eating facilities and change rooms are clean and are free from settled dust.

(4) Shower as part of personal decontamination.

b. Exposures over the Action Level (0.03 mg/cubic meter):

(1) Assure exposed individuals enrolled in the medical surveillance program.

(2) Assure exposed individuals enrolled in and up to date with lead exposure training requirements.

3.6.2 Control Efficiency of Containment Features

The QSHP shall review and document results of the visual inspection determining visual clearance criteria are being met while lead hazard control activities are being performed. The QSHP shall review analytical results from samples taken to determine if lead is migrating outside lead hazard control areas at levels in excess of clearance criteria. The QSHP shall notify the Contracting Officer and apply the following actions if results exceed project specific clearance levels outside the lead hazard control area:

a. Require/improve containment.

b. Improve work practices to reduce lead aerosol generation.

3.6.3 Clearance

The QSHP shall review analytical results for the samples taken to determine compliance with project specific clearance requirements. The following actions apply and shall be performed at the Contractor's expense if project specific clearance levels are exceeded:

Reclean surfaces.
Retest to determine clearance.

3.6.4 Removal of Lead Hazard Control Area

Upon acceptance of the final clearance certification by the Contracting Officer, and when authorized, cleared Lead Hazard Control Area boundary controls and warning signs shall be removed.

3.7 CLEARANCE REPORT

The QSHP shall prepare a clearance report including the following information:

a. Start and completion dates of lead hazard control activities.

b. Type of lead hazard control activity performed (i.e., abatement, interim control, renovation, remodeling), locations and lead hazards controlled or abated.

c. The name and address of each firm conducting lead hazard control activities and the name of each supervisor assigned to the project.

d. The Occupant Protection Plan prepared pursuant to paragraph OCCUPANT PROTECTION PLAN.

e. The name, address and signature of the QSHP or independent risk assessor to indicate clearance requirements have been met.

f. Certification of each Final Cleaning and Visual Inspection performed by the QSHP.

g. Analytical results from clearance sampling performed by the QSHP or independent risk assessor, the name of the laboratory that conducted the analysis. Results shall be provided in both the laboratory report and on the appropriate example forms provided at the end of this section.

h. A detailed written description of the lead hazard control activities performed, including hazard control methods used, locations of rooms and/or components where lead hazard control activities occurred, reason for selecting particular hazard control methods for each component, and any suggested monitoring of encapsulants or enclosures.

i. Waste disposal documentation.

j. Contractor provided installation/maintenance manuals.

3.8 TITLE TO MATERIALS

Materials resulting from demolition work, except as specified otherwise, shall be come the property of the Contractor, and shall be disposed of off Government Property.

3.9 PAYMENT FOR HAZARDOUS WASTE

Payment for disposal of hazardous waste will not be made until a signed copy of the manifest from the treatment or disposal facility certifying the amount of lead-containing materials delivered is returned and a copy is furnished to the Government.

3.10 CERTIFICATION OF VISUAL INSPECTION

Certify that the lead hazard control ares(s) for each individual work task data elements have passed visual clearance criteria and are ready for clearance sampling. To pass visual clearance, lead hazards have to be removed; control technology appropriately applied/installed; the lead hazard control area must be free from visible dust debris, paint chips or any other residue that may have been generated by the lead hazard control activities.

Signature by the QSHP indicates that the described lead hazard control area(s) have passed visual clearance criteria. Provide detailed description of each Lead Hazard Control Area.

_____

_____

_____

BY:_____
QSHP Date

Print name and title _____

CONTRACTING OFFICER ACCEPTANCE OR REJECTION

The Contracting Officer hereby determines that the Contractor has performed visual inspection of the lead hazard control area and by quality assurance inspection, finds the Contractor's work to be:

_____ Acceptable, ready for performance of clearance sampling

_____ Unacceptable, Contractor instructed to re-clean the lead hazard control area

BY: Contracting Officer's Representative

_____
Signature Date

Print name and title_____

Lead Hazard Control Clearance Sampling Certification Form

Date_____

Name of QSHP or Certified Risk Assessor_____

License No._____

Work Task Data Element _____

Clearance Levels_____
40 CFR 745 Clearance Levels
24 CFR 35 Clearance Levels

Sample quantity and location:
Windows _____
Floors _____
Exterior Soils _____

Date of sample collection_____Date Shipped to lab_____

Shipped by_____
Signature

I certify that the clearance samples taken meet the clearance sampling requirements of this contract.

By:_____ Date:_____
QSHP or independent risk assessor

Print name and Title:_____

CONTRACTING OFFICER ACCEPTANCE OR REJECTION

I have inspected sampling locations and procedures and have found them to be

_____Acceptable, meet contract requirements.

_____Unacceptable, do not meet contract requirements, Contractor is directed to resample.

By: Contracting Officer's Representative

Signature Date

Print Name and Title_____

INDIVIDUAL WORK TASK DATA ELEMENTS

Sheet _____ of _____

There is a separate data sheet for each individual work task.

WORK TASK DESIGNATION NUMBER: _____

2. LOCATION OF WORK TASK:

3. BRIEF DESCRIPTION OF THE LEAD HAZARD CONTROL ACTIVITY:

4. POST LEAD HAZARD CONTROL BUILDING/FACILITY USE: COMMERCIAL/PUBLIC

5. LEAD CONTAMINATED DEBRIS DISPOSAL DESTINATION: Construction Debris/Sanitary

6. CLEARANCE REQUIREMENTS: 40 CFR 745 VISUAL

-- End of Section --

ATTACHMENT 18

# UNDERGROUND STORAGE TANK, PCB BALLAST, AND MERCURY LIGHT SWITCH INSPECTION FOR BLDGS 355, 356, 357 AND 358

This investigation report is prepared for:

U.S. Army Honolulu Engineer District
Attn: CEPOH-ED-EH, Bldg. 252
Fort Shafter, HI 96858-5440

# UNDERGROUND STORAGE TANK, PCB BALLAST, AND MERCURY LIGHT SWITCH INSPECTION FOR BUILDINGS 355, 356, 357, AND 358 (QUAD C) SCHOFIELD BARRACKS, OAHU, HAWAII

MNA Job No. 10112

June 5, 2002

For
Edwin Boyette
Environmental Specialist

Myounghee Noh
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## EXECUTIVE SUMMARY

Myounghee Noh & Associates, L.L.C. (MNA), under contractual agreement with the U.S. Army Honolulu Engineer District (HED), conducted a building inspection for hazardous materials at Quad C (Buildings 355, 356, 357, and 358), Schofield Barracks, Island of Oahu, Hawaii, in May 2002. The project is being completed for the HED under the Contract No. DACA83-02-P-0007 and is titled: Underground Storage Tank (UST), PCB Ballast Inspection for Buildings 355, 356, 357, and 358 (Quad C), Schofield Barracks, Oahu, Hawaii.

Quad C buildings were built during World War II and are planned for renovation as part of the Whole Barracks Renewal Brigade Complex, Phase 3A. The purpose of the survey was to identify the existence of the hazardous substances, such as PCBs and mercury, and heating oil tanks with associated piping, which may be disrupted during the renovation.

Myounghee Noh served as the project manager, and Edwin Boyette led a two-man field inspection team during the May 2002 survey. Miriam Koyanagi of HED provided the project oversight as the Government Technical Manager, and Capt. John Manion of the Army Directorate of Public Works (DPW) helped provide access to the units within Quad C.

During May 13 – June 1, 2002, MNA inventoried light fixtures, fluorescent light tubes, and light switches in 840 units (~92%) within Quad C but was not able to access 74 units (8%). A total of 2,444 light fixtures were inventoried of which 347 fixtures (14%) were opened and inspected. Seventeen light fixtures suspected of containing PCBs were found in Quad C: nine in Bldg 356 (units 116 & 180); seven in Bldg 357 (corridors 135 & 145, units 120A, 120B, & 158); and one in Bldg 358 (unit 116).

The total number of fluorescent light tubes suspected of containing mercury is estimated to be 6,006 in Quad C: 1,116 in Bldg 355; 1,362 in Bldg 356; 1,931 in Bldg 357; and 1,597 in Bldg 358. Due to inaccessibility of the 74 units, MNA made estimates for the number of light fixtures and light tubes in those units. No light switches suspected of containing mercury were found. The survey results are presented in Table 1 and Appendix B.

A visual inspection of the boiler rooms and vicinity was conducted. The boiler systems previously utilized fuel oil burning system had been replaced by propane burner systems. All connections of fuel oil piping were found disconnected and removed from the boiler rooms except for those in Bldg 358 (Photographs in Appendix A).

According to a review of plans obtained from the Army Directorate of Public Works (DPW), the four fuel oil tanks were to be closed during a project entitled: Remove/Replace UST System (Quad C, Bldgs 355, 356, 357, & 358), Schofield Barracks, Oahu, Hawaii (E-94-59). The DPW plan specified that the USTs were to be closed in accordance with the Hawaii Department of Health (DOH) UST Technical Guidance Manual; however, no closure reports were obtained for review. MNA recommends a review of the UST contractor submittals and notification to the DOH for permanent closures.

## 1.0 INTRODUCTION

Myounghee Noh & Associates, L.L.C. (MNA), under contractual agreement with the U.S. Army Honolulu Engineer District (HED), conducted a building inspection for hazardous materials at Quad C (Buildings 355, 356, 357, and 358), Schofield Barracks, Island of Oahu, Hawaii. The underground storage tank (UST), polychlorinated biphenyls (PCBs) ballast, and mercury lamp & light switch survey is being completed for the HED under the Contract No. DACA83-02-P-0007.

Quad C buildings were built during World War II and are planned for renovation as part of the Whole Barracks Renewal Brigade Complex, Phase 3A. The purpose of the survey was to identify the existence of the hazardous substances, such as PCBs and mercury, and heating oil tanks with associated piping, which may be disrupted during the renovation.

Myounghee Noh served as the project manager, and Edwin Boyette led a two-man field inspection team during the May 13 - June 1, 2002, survey. Miriam Koyanagi of HED provided the project oversight as the Government Technical Manager, and Capt. John Manion of the Army Directorate of Public Works (DPW) helped provide access to the units within Quad C.

## 2.0 BUILDING INSPECTION

Prior to the initiation of the fieldwork, floor plans of Buildings 355, 356, 357, and 358 were obtained from DPW and reviewed for planning. Each floor was split into sections based on the locations of the interior firewalls or other dividing points. The sequence of inspection was as follows:

- Upon entering each section, the Inspector and Inspector Technician surveyed the area for evident health and safety concerns such as broken fluorescent bulbs, exposed wiring, leaking dielectric fluid from ballasts, slips, trips, and/or falls hazards, and other general safety issues.
- Inventoried the fluorescent light fixtures and bulbs in individual rooms and common areas for PCB and mercury content.
- Randomly selected fluorescent fixtures for inspection (min. 10% planned).
- (First floor only) Checked light switches for mercury content.
- Inspected boiler room and its vicinity for evidence of fuel supply piping, vent lines, and fuel tanks.

Included in this section is a description of the field methodology employed in the survey.

### *2.1 PCB Ballast Inspection*

The number of fluorescent light fixtures in the rooms and common areas was recorded, and the fixtures to be inspected were selected. A minimum of 10% of the fixtures per floor section was inspected. Locked areas were noted on the floor plan. The Inspector Technician confirmed that the light switch was off, the fixture was opened, ballast cover plate removed, and the ballast label was reviewed to identify the "No PCBs" label. Ballasts that were not labeled "No PCBs" were assumed to contain PCBs. The location of the inspected fixtures with the make and type of ballast was noted on a sketch of the sampled room or area. The fixture was reassembled following inspection.

A second walk-through of the accessible areas was conducted following compilation of the data set into figures and tables as a quality assurance/quality control (QA/QC) to confirm the accuracy of the field data.

### *2.2 Mercury Containing Fluorescent Bulb Inspection*

The manufacturer and trade name of the bulb types in the inspected fixtures were noted during the PCB ballast inspection. Based on review of manufacturer's product information, all fluorescent lamps were assumed to contain mercury. During a subsequent walk-through, concurrently with the PCB ballast inspection, a QA/QC review was conducted to confirm the number of fluorescent bulbs per floor section.

### *2.3 Mercury Containing Light Switches*

Review of the manufacturer and historical information regarding the types of light switches indicated that mercury-containing switches are referred as "silent switches." The light switch inspection was limited to the first floor of each building, based on the information obtained during the pre-inspection meeting with the Government Technical Manager.

All accessible switches were sampled and the results noted on the floor plan. Each accessible switch was activated, and if an audible "click" or mechanical contact noise was noted, it was labeled as a contact switch. If switch activation did not produce an audible contact noise, the cover plate was removed and the switch surface was surveyed for the word "top" which would indicate that mercury was used in the mechanism. The cover plates were reinstalled following inspection.

### *2.4 UST Inspection*

A visual inspection of each boiler room and its vicinity was conducted to identify existing fuel storage tank, fuel supply piping, vent pipes, and possible indications of tank removals. The State of Hawaii Department of Health, UST Section, was consulted to confirm the registration status of four fuel storage tanks. Boiler tanks are exempt from the UST system upgrade requirements of 40 CFR 280 and are typically considered to be unregulated.

## 3.0 FINDINGS

### *3.1 PCB Ballasts*

A total of 2,444 light fixtures were inventoried, and 347 fixtures were opened up for inspection (14%); however, MNA was not able to access 74 units in Quad C due to unavailability of keys. Seventeen light fixtures suspected of containing PCBs were found in Quad C:

- Nine in Bldg 356 - units 116 & 180
- Seven in Bldg 357 - corridors 135 & 145, units 120A, 120B, & 158)
- One in Bldg 358 - unit 116

Based on the inspection findings, MNA estimates that there are no light fixtures suspected of containing PCBs in those inaccessible units on the 2nd and 3rd floors; however, if the 1st floor light fixtures are not labeled with "Rainbow Electric," they may contain PCBs. A summary of the survey is presented in Table 1, and a spreadsheet containing the field data is provided in Appendix A.

### *3.2 Mercury-containing Fluorescent Tubes*

A total of 5,561 fluorescent light tubes were counted from 914 units in Quad C. Due to the 74 (approximately 8%) inaccessible units, MNA made an assumption for the number of light tubes in those inaccessible units. The total number of light tubes estimated is 6,006 (Table 1 & Appendix A).

**Table 1. Summary of Quad C Light Fixtures and Switch Information**

| | Bldg 355 | Bldg 356 | Bldg 357 | Bldg 358 | Total |
|---|---|---|---|---|---|
| Total no. rooms | 195 | 245 | 235 | 243 | **918** |
| No. of inaccessible rooms | 8 | 10 | 26 | 30 | **74** |
| Percent room completed | 96% | 96% | 89% | 88% | **92%** |
| Light fixtures inventoried | 506 | 595 | 678 | 665 | **2,444** |
| Light fixtures inspected | 89 | 88 | 81 | 89 | **347** |
| PCB-suspect light fixtures | 0 | 9 | 7 | 1 | **17** |
| Light tubes counted | 1,086 | 1,327 | 1,751 | 1,397 | **5,561** |
| Additional fluorescent tubes estimated* | 30 | 35 | 180 | 200 | **445** |
| Total fluorescent tubes estimated * | 1,116 | 1,362 | 1,931 | 1,597 | **6,006** |
| Mercury-suspect light switches | 0 | 0 | 0 | 0 | **0** |

*Assumption was made due to the inaccessible units.

### *3.3 Mercury-containing Light Switches*

One hundred percent of accessible light switches were tested; however, no light switches suspected of containing mercury were found.

### *3.4 USTs*

No active connections of fuel oil supply and return piping in the boiler rooms were observed in the four Quad C buildings. The boiler systems previously utilized for the fuel oil burning system had been replaced by propane burner systems. Review of plans obtained from DPW indicated that the four tanks were to be closed during a project entitled: Remove/Replace UST System (Quad C, BLDGS 355, 356, 357, & 358), Schofield Barracks, Oahu, Hawaii (E-94-59).

All connections of fuel piping were found disconnected and removed from the boiler room except for those in Bldg 358 (Photographs 1-13 in Appendix A). The fuel oil supply and return piping of Bldg 358 had not been removed from the room (Photograph 11). The piping was observed to run from the pavement surface through the outside of the boiler room wall. A repair was observed on the pavement running from the boiler room wall to the reported location of the fuel UST. The repair appeared to be old and the repair joint was not sawcut as is the modern practice, which may indicate that the piping remains in place (Photograph 13). The vent line was cut approximately five inches above the pavement surface (Photograph 13). A summary of the findings is presented in Table 2.

## 4.0 LIMITATIONS

Every reasonable effort was made to identify suspect PCB- and mercury-containing materials and USTs during the survey of the subject buildings. However, this does not imply a guarantee that all possible sources of hazardous substance were identified by this assessment, because certain building materials and/or surfaces may be hidden by walls, flooring, partitions, etc. When suspect materials previously hidden by building components are uncovered, additional survey may be required prior to renovation or abatement.

## 5.0 RECOMMENDATIONS

The four boiler USTs remain registered with the State of Hawaii DOH. MNA recommends submittal of the UST closure documentations to DOH for proper record keeping.

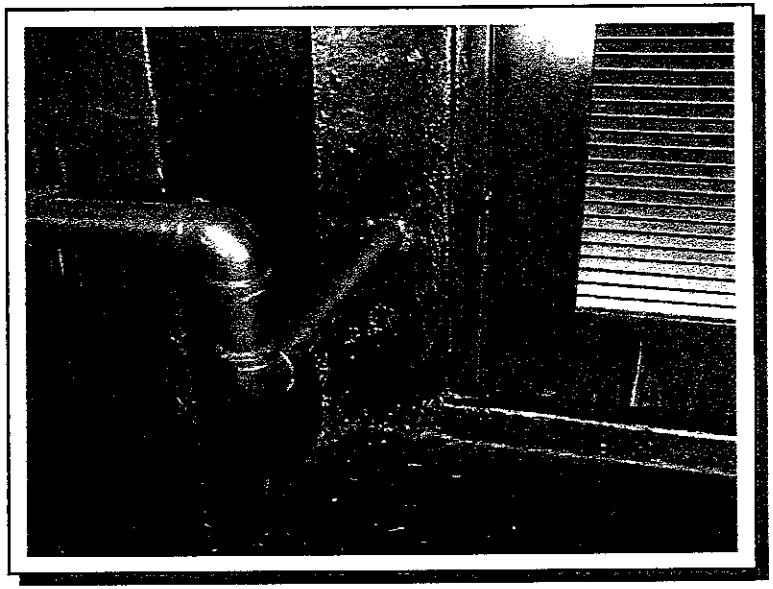
**Table 2. Summary of Quad C Former UST Information**

| Quad C Building | Source of Information | Findings |
|---|---|---|
| All | DOH UST registration | USTs for all four buildings are currently registered. |
| All | Project Plans (E-94-59), Sheets C-2, C-3, and M-1 | USTs were to be removed from service, piping systems disconnected, and soil samples collected and tested for UST closure. |
| 355 | Field verification | • Fuel oil piping disconnected from boiler room.<br>• Pavement above the UST is cut and repaired in typical method for in-place UST closure.<br>• Observation is consistent with demolition plans and notes. |
| 356 | Field verification | • Fuel oil piping is disconnected from boiler room. The fuel oil piping and vent line may be in place under the sidewalk.<br>• Concrete encasements which were shown on the site plans to incorporate the check valve and fill port were not evident. |
| 357 | Field verification | • Fuel oil piping is disconnected from boiler room and was not cut adjacent to the bldg wall. The vent line remains in place.<br>• Concrete encasements which were shown on the site plans to incorporate the check valve and fill port were not evident. |
| 358 | Field verification | • Fuel oil piping is disconnected from boiler room. The fuel oil piping and vent line may be in place under the sidewalk.<br>• Concrete encasements which were shown on the site plans to incorporate the check valve and fill port were not evident.<br>• A concrete cover or slab was present near the referenced location of the UST. |

# APPENDIX A

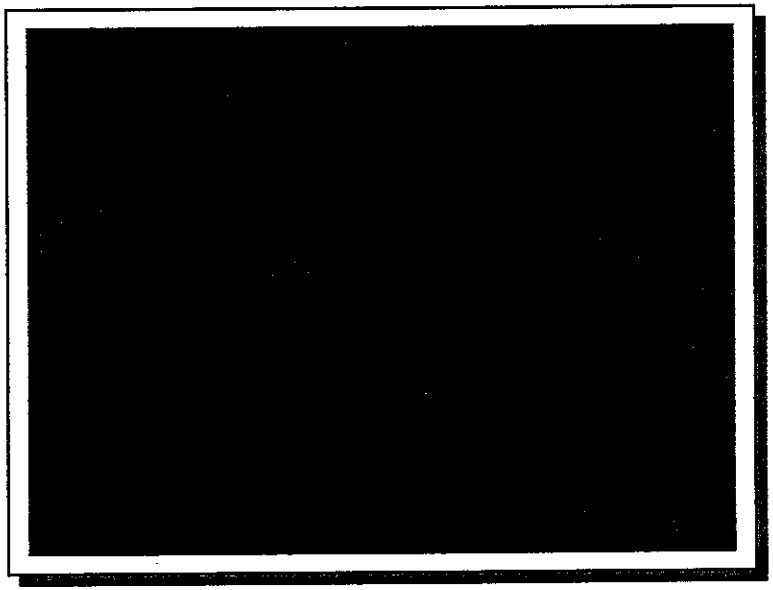
## UST Photographs

Photograph 1. A view of sawcuts in the pavement outside Bldg 355 boiler rm. The UST fill port remains in the pavement (5/27/02).

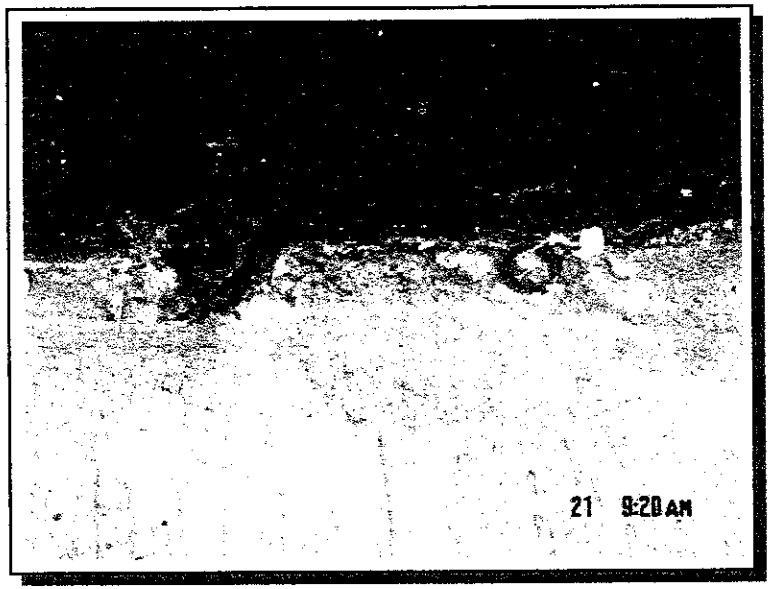


Photograph 2. Piping outside Bldg 355 boiler room. One of the penetrations is sealed and the other used for the propane piping (5/27/02).

Photograph 3. A view of the former UST vent pipe outside Bldg 355 boiler room (5/27/02).



Photograph 4. Bldg 356 boiler room. One of the penetrations is sealed and the other used for the propane piping (5/21/02)

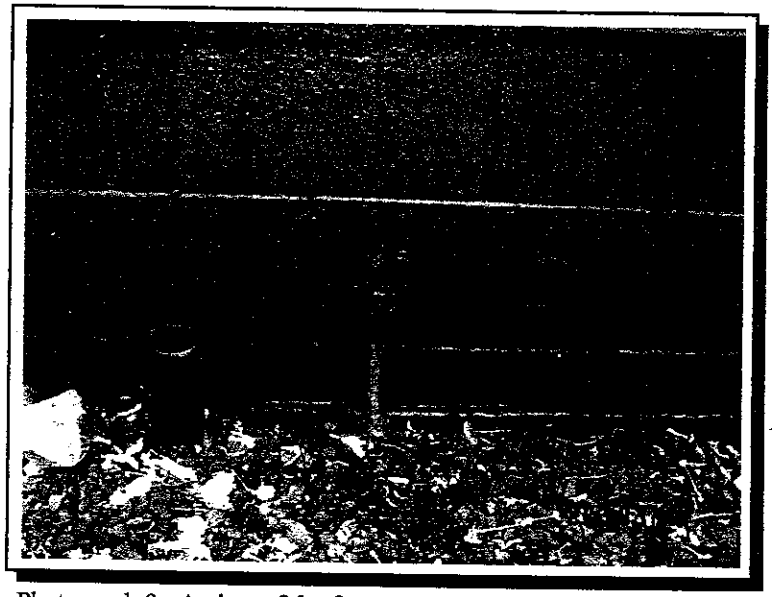



Photograph 5. Former fuel piping cut above the pavement surface outside Bldg 356 boiler room (5/21/02).

Photograph 6. A view of the former vent pipe and wall penetration outside Bldg 356 (5/21/02).

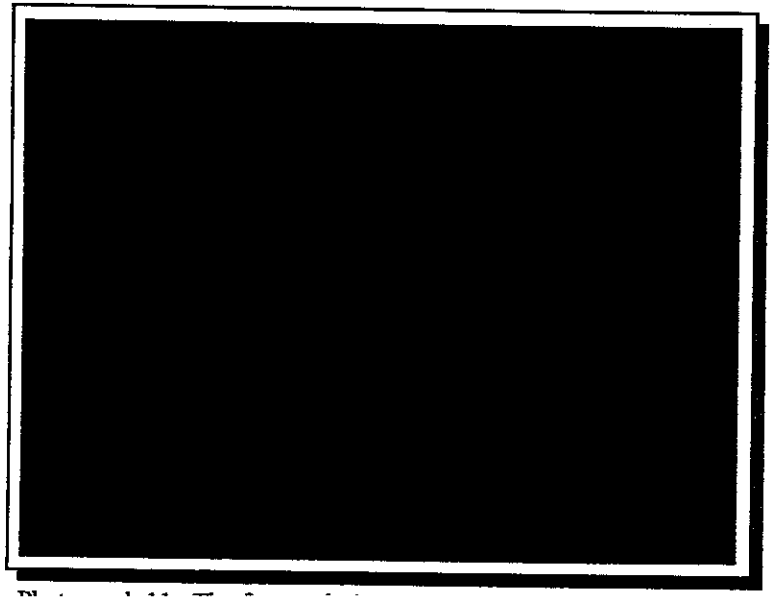
Photograph 7. Approx. location of the former UST at Bldg 356. The vent pipe and wall penetration is shown in background (5/21/02).

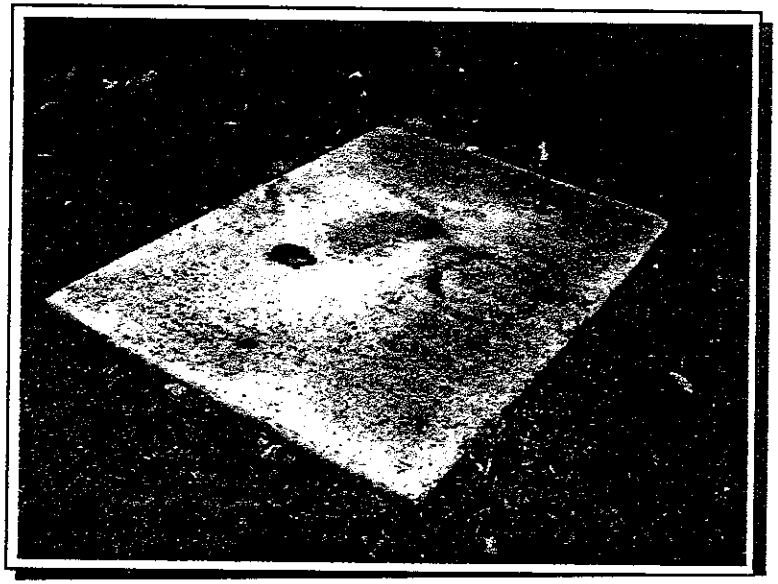
Photograph 8. A view of the Bldg 357 boiler room. Both wall penetrations were sealed (5/21/02).

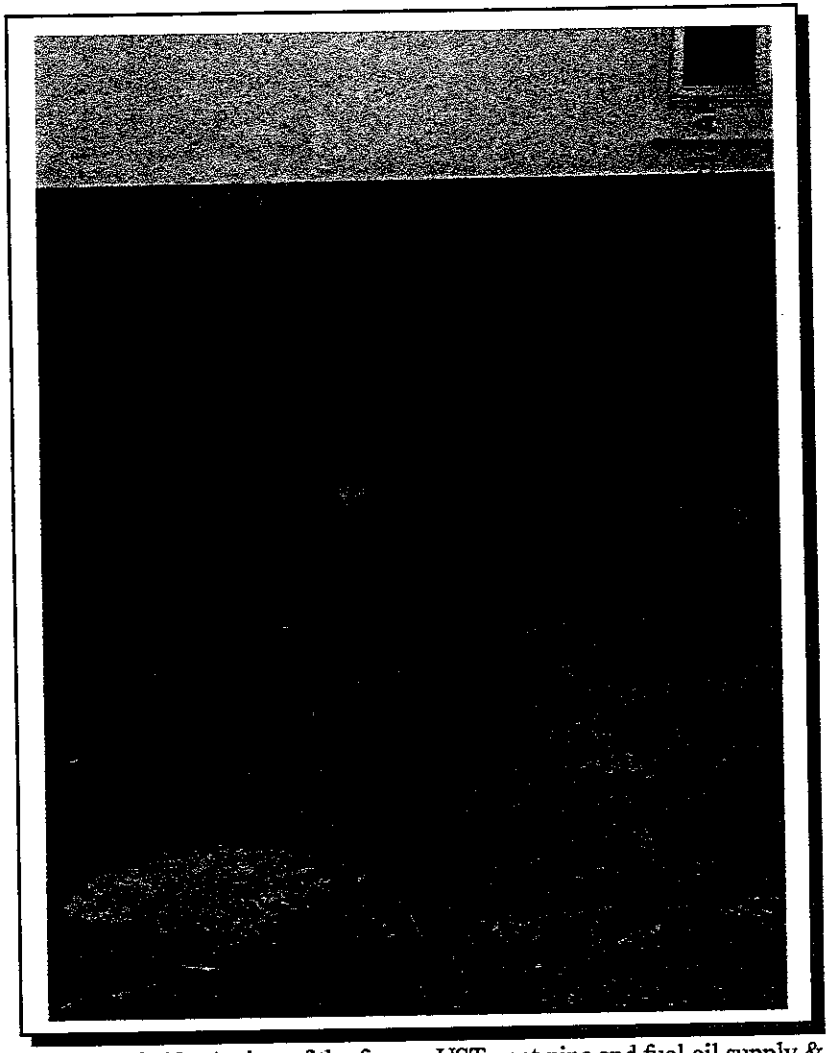


Photograph 9. A view of the former vent pipe and sealed penetrations at Bldg 357 boiler room (5/21/02).

Photograph 10. Approximate location of the former UST at Bldg 357 (5/21/02).







Photograph 13. A view of the former UST vent pipe and fuel oil supply & return piping outside Bldg 358 boiler room. The vent pipe had been cut but did not appear to be sealed. The area of repaired concrete agreed with the piping locations shown on the demolition plan (5/21/02).

# APPENDIX B

## Field Data Compiled

Schofield Barracks Quad C Inspection
DACA83-02-P-0007

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | 100 | 355-1-A | 4 | | INV | | 8 |
| 355 | 100A | 355-1-A | 4 | | INV | | 8 |
| 355 | 100B | 355-1-A | 1 | | INV | | 2 |
| **355** | **Corr 101** | **355-1-A** | **2** | **2** | **NO PCBS** | **GE Ecolux** | **4** |
| 355 | 102 | 355-1-A | 8 | | INV | | 16 |
| 355 | 103 | 355-1-A | 3 | | INV | | 6 |
| 355 | 104 | 355-1-A | 5 | | INV | | 6 |
| **355** | **104A** | **355-1-A** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **20** |
| **355** | **105** | **355-1-A** | **3** | **3** | **NO PCBS** | **GE Ecolux** | **8** |
| 355 | 106 | 355-1-A | 4 | | INV | | 6 |
| 355 | 107 | 355-1-A | 3 | | INV | | 8 |
| 355 | 108 | 355-1-A | 4 | | INV | | 6 |
| 355 | 108A | 355-1-A | 2 | | INV | | 8 |
| **355** | **108B** | **355-1-A** | **2** | **2** | **NO PCBS** | **GE Ecolux** | **6** |
| 355 | 108C | 355-1-A | 2 | | INV | | 8 |
| 355 | 109 | 355-1-A | | | No Access | | |
| 355 | 110 | 355-1-A | | | No Access | | |
| 355 | 111 | 355-1-A | | | No Access | | |
| 355 | 112 | 355-1-A | | | No Access | | |
| 355 | Corr 113 | 355-1-A | 2 | | INV | | 4 |
| 355 | Corr 114 | 355-1-A | 2 | | INV | | 4 |
| 355 | 115 | 355-1-B | | | No Access | | |
| 355 | 116 | 355-1-B | | | No Access | | |
| 355 | 117 | 355-1-B | | | No Access | | |
| 355 | Corr 118 | 355-1-B | | | No Access | | |
| 355 | Corr 119 | 355-1-B | | | No Access | | |
| 355 | 120 | 355-1-B | | | No Access | | |
| 355 | 121 | 355-1-B | | | No Access | | |
| 355 | 122 | 355-1-B | | | No Access | | |
| 355 | 123 | 355-1-B | | | No Access | | |
| 355 | 124 | 355-1-B | | | No Access | | |
| 355 | 125 | 355-1-B | | | No Access | | |
| 355 | 126 | 355-1-B | | | No Access | | |
| 355 | 127 | 355-1-B | | | No Access | | |
| 355 | 128 | 355-1-B | | | No Access | | |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | 129 | 355-1-B | | | No Access | | |
| 355 | 130 | 355-1-B | | | No Access | | |
| 355 | 131 | 355-1-B | | | No Access | | |
| 355 | 132 | 355-1-B | | | No Access | | |
| **355** | **Breezeway** | **355-1-B** | **10** | **10** | **NO PCBs** | **Sylvania Octron** | **20** |
| 355 | 136 | 355-1-C | 3 | | INV | | 6 |
| 355 | 137 | 355-1-C | 13 | | INV | | 26 |
| 355 | 137A | 355-1-C | 3 | | INV | | 6 |
| 355 | 137B | 355-1-C | 8 | | INV | | 16 |
| 355 | 138 | 355-1-C | 2 | | INV | | 4 |
| 355 | 139 | 355-1-C | 11 | | INV | | 22 |
| 355 | 140 | 355-1-C | 0 | | INV | | 0 |
| 355 | Corr 141 | 355-1-D | 4 | | INV | | 8 |
| **355** | **Corr 142** | **355-1-D** | **4** | **2** | **NO PCBS** | **Sylvania Octron** | **8** |
| 355 | 143 | 355-1-D | 4 | | INV | | 8 |
| 355 | 144 | 355-1-D | 6 | | INV | | 12 |
| **355** | **145** | **355-1-D** | **5** | **5** | **INV** | **Sylvania Octron** | **10** |
| 355 | 145A | 355-1-D | 2 | | INV | | 4 |
| 355 | 146 | 355-1-D | 2 | | INV | | 4 |
| 355 | 147 | 355-1-D | 2 | | INV | | 4 |
| 355 | 148 | 355-1-D | | | No Access | | |
| 355 | 149 | 355-1-D | | | No Access | | |
| 355 | 151 | 355-1-D | 4 | | INV | | 8 |
| 355 | 152 | 355-1-D | 6 | | INV | | 12 |
| 355 | 153 | 355-1-D | 2 | | INV | | 4 |
| 355 | 154 | 355-1-D | 3 | | INV | | 6 |
| 355 | 155 | 355-1-D | 2 | | INV | | 4 |
| 355 | 156 | 355-1-D | 2 | | INV | | 4 |
| 355 | 157 | 355-1-D | 6 | | INV | | 12 |
| **355** | **Corr 158** | **355-1-D** | **3** | **3** | **NO PCBs** | **Sylvania Octron** | **6** |
| **355** | **Corr 159** | **355-1-D** | **2** | **2** | **NO PCBs** | **Sylvania Octron** | **4** |
| 355 | 200 | 355-2-A | 0 | | INV | | 0 |
| **355** | **201** | **355-2-A** | **2** | **2** | **NO PCBs** | **Phillips Alto** | **4** |
| 355 | 202 | 355-2-A | 11 | | INV | | 22 |
| 355 | 203 | 355-2-A | 4 | | INV | | 8 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | 204 | 355-2-A | 2 | | INV | | 4 |
| **355** | **205** | **355-2-A** | **3** | **3** | INV | **Phillips Alto** | **6** |
| 355 | 206 | 355-2-A | 3 | | INV | | 6 |
| 355 | 207 | 355-2-A | 3 | | INV | | 6 |
| 355 | 208 | 355-2-A | 4 | | INV | | 8 |
| **355** | **209** | **355-2-A** | **8** | **8** | **NO PCBs** | **Phillips Alto** | **16** |
| 355 | 210 | 355-2-A | 4 | | INV | | 8 |
| 355 | 211 | 355-2-A | 2 | | INV | | 4 |
| 355 | 212 | 355-2-A | 1 | | INV | | 2 |
| 355 | Corr 213 | 355-2-A | 2 | | INV | | 6 |
| 355 | Corr 214 | 355-2-A | 5 | | INV | | 20 |
| 355 | Corr 215 | 355-2-A | 2 | | INV | | 6 |
| 355 | 219 | 355-2-A | 14 | | INV | | 28 |
| 355 | 220 | 355-2-A | 0 | | INV | | 0 |
| 355 | 221 | 355-2-A | 2 | | INV | | 4 |
| **355** | **222** | **355-2-A** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| **355** | **224** | **355-2-A** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 355 | 225 | 355-2-A | 2 | | INV | | 4 |
| 355 | 226 | 355-2-A | 2 | | INV | | 4 |
| 355 | 227 | 355-2-A | 2 | | INV | | 4 |
| 355 | 228 | 355-2-B | 2 | | INV | | 4 |
| 355 | 229 | 355-2-B | 2 | | INV | | 4 |
| 355 | 230 | 355-2-B | 2 | | INV | | 4 |
| 355 | 231 | 355-2-B | 2 | | INV | | 4 |
| **355** | **Dayroom** | **355-2-B** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| **355** | **232** | **355-2-B** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 355 | Corr 233 | 355-2-B | 8 | | INV | | 32 |
| 355 | Corr 234 | 355-2-B | 2 | | INV | | 4 |
| 355 | 234 | 355-2-B | 2 | | INV | | 4 |
| 355 | 235 | 355-2-B | 2 | | INV | | 4 |
| 355 | 235A | 355-2-B | 0 | | INV | | 0 |
| 355 | 235B | 355-2-B | 0 | | INV | | 0 |
| 355 | 236 | 355-2-B | 2 | | INV | | 4 |
| 355 | 237 | 355-2-B | 2 | | INV | | 4 |
| 355 | 238 | 355-2-B | 2 | | INV | | 4 |

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| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | 239 | 355-2-B | 2 | | INV | | 4 |
| 355 | 239A | 355-2-B | 0 | | INV | | 0 |
| 355 | 239B | 355-2-B | 0 | | INV | | 0 |
| 355 | 240 | 355-2-B | 2 | | INV | | 4 |
| 355 | Corr 241 | 355-2-B | 2 | | INV | | 4 |
| 355 | 242 | 355-2-B | 2 | | INV | | 4 |
| 355 | 243 | 355-2-B | 2 | | INV | | 4 |
| 355 | 244 | 355-2-B | 2 | | INV | | 4 |
| 355 | 245 | 355-2-B | 2 | | INV | | 4 |
| 355 | 246 | 355-2-B | 2 | | INV | | 4 |
| 355 | 247 | 355-2-B | 2 | | INV | | 4 |
| 355 | 248 | 355-2-C | 2 | | INV | | 4 |
| 355 | 249 | 355-2-C | 2 | | INV | | 4 |
| 355 | 250 | 355-2-C | 2 | | INV | | 4 |
| 355 | 251 | 355-2-C | 2 | | INV | | 4 |
| 355 | 252 | 355-2-C | 2 | | INV | | 4 |
| 355 | 252A | 355-2-C | | | No Access | | |
| 355 | 252B | 355-2-C | 2 | | INV | | 4 |
| 355 | 253 | 355-2-C | 15 | | INV | | 30 |
| **355** | **254** | **355-2-C** | **8** | **8** | **NO PCBs** | **Phillips Alto** | **16** |
| 355 | Corr 254 | 355-2-C | 2 | | INV | | 5 |
| **355** | **255** | **355-2-C** | **7** | **7** | **NO PCBs** | **Phillips Alto** | **14** |
| 355 | 256 | 355-2-C | 3 | | INV | | 6 |
| 355 | Corr 257 | 355-2-C | 8 | | INV | | 32 |
| 355 | 258 | 355-2-C | 1 | | INV | | 2 |
| 355 | 259 | 355-2-C | 3 | | INV | | 6 |
| 355 | 260 | 355-2-C | 2 | | INV | | 4 |
| 355 | 261 | 355-2-C | 4 | | INV | | 8 |
| **355** | **262** | **355-2-C** | **6** | **6** | **NO PCBs** | **Phillps Alto** | **12** |
| 355 | 263 | 355-2-C | 4 | | INV | | 8 |
| 355 | Corr 264 | 355-2-C | 2 | | INV | | 5 |
| 355 | 265 | 355-2-C | 4 | | INV | | 8 |
| 355 | 266 | 355-2-C | 4 | | INV | | 8 |
| 355 | 267 | 355-2-C | 2 | | INV | | 4 |
| 355 | 268 | 355-2-C | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | Corr 269 | 355-2-C | 2 | | INV | | 8 |
| 355 | 300 | 355-3-A | | | No Access | | |
| 355 | 301 | 355-3-A | 2 | | INV | | 4 |
| **355** | **302** | **355-3-A** | **2** | **2** | **NO PCBs** | **Philiips Econowatt** | **4** |
| 355 | 303 | 355-3-A | 3 | | INV | | 6 |
| 355 | 304 | 355-3-A | 0 | | INV | | 0 |
| 355 | 305 | 355-3-A | 0 | | INV | | 0 |
| 355 | 306 | 355-3-A | 0 | | INV | | 0 |
| 355 | 307 | 355-3-A | 0 | | INV | | 0 |
| 355 | Corr 308 | 355-3-A | 2 | | INV | | 4 |
| 355 | Corr 309 | 355-3-A | 5 | | INV | | 10 |
| 355 | Corr 310 | 355-3-A | 2 | | INV | | 4 |
| 355 | 311 | 355-3-A | 2 | | INV | | 4 |
| **355** | **312** | **355-3-A** | **2** | **2** | **NO PCBs** | **Philiips Econowatt** | **4** |
| 355 | 313 | 355-3-A | 3 | | INV | | 6 |
| 355 | 314 | 355-3-A | 2 | | INV | | 4 |
| 355 | 315 | 355-3-A | 2 | | INV | | 4 |
| 355 | 316 | 355-3-A | 2 | | INV | | 4 |
| 355 | 317 | 355-3-A | 2 | | INV | | 4 |
| 355 | 318 | 355-3-A | 3 | | INV | | 6 |
| 355 | 319 | 355-3-A | | | No Access | | |
| **355** | **320** | **355-3-A** | **2** | **2** | **NO PCBs** | **Philiips Econowatt** | **4** |
| 355 | 321 | 355-3-A | 2 | | INV | | 4 |
| **355** | **322** | **355-3-A** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 355 | 323 | 355-3-A | 14 | | INV | | 28 |
| 355 | 325 | 355-3-A | 2 | | INV | | 4 |
| 355 | 326 | 355-3-A | 1 | | INV | | 2 |
| 355 | 327 | 355-3-A | 0 | | INV | | 0 |
| 355 | 328 | None | | | Gymnasium No Florescent | Light tubes | |
| 355 | 329 | 355-3-C | 4 | | INV | | 8 |
| 355 | 330 | 355-3-C | 2 | | INV | | 4 |
| 355 | 331 | 355-3-C | 14 | | INV | | 28 |
| 355 | Corr 333 | 355-3-C | 2 | | INV | | 4 |
| 355 | Corr 334 | 355-3-C | 5 | | INV | | 10 |
| 355 | Corr 335 | 355-3-C | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 355 | 336 | 355-3-C | 3 | | INV | | 6 |
| **355** | **337** | **355-3-C** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 355 | 338 | 355-3-C | 2 | | INV | | 4 |
| 355 | 339 | 355-3-C | 2 | | INV | | 4 |
| **355** | **340** | **355-3-C** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 355 | 341 | 355-3-C | 2 | | INV | | 4 |
| 355 | 342 | 355-3-C | 2 | | INV | | 4 |
| 355 | 343 | 355-3-C | 2 | | INV | | 4 |
| **355** | **344** | **355-3-C** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **6** |
| 355 | 345 | 355-3-C | 2 | | INV | | 4 |
| 355 | 346 | 355-3-C | 2 | | INV | | 4 |
| 355 | 347 | 355-3-C | | | No Access | | |
| 355 | 348 | 355-3-C | 0 | | INV | | 0 |
| 355 | 349 | 355-3-C | | | No Access | | |
| 355 | 350 | 355-3-C | 0 | | INV | | 0 |
| 355 | 351 | 355-3-C | 3 | | INV | | 6 |
| 355 | 352 | 355-3-C | | | No Access | | |
| 355 | 353 | 355-3-C | 2 | | INV | | 4 |
| 355 | 354 | 355-3-C | 2 | | INV | | 4 |
| 355 | 356 | 355-3-C | 3 | | INV | | 6 |
| 356 | 100 | 356-1-A | | | NO Access | | |
| 356 | 101 | 356-1-A | | | NO Access | | |
| 356 | 102 | 356-1-A | | | NO Access | | |
| 356 | 103 | 356-1-A | | | NO Access | | |
| 356 | 104 | 356-1-A | | | NO Access | | |
| 356 | Corr 105 | 356-1-A | | | NO Access | | |
| 356 | Corr 107 | 356-1-A | | | NO Access | | |
| 356 | 108 | 356-1-A | | | NO Access | | |
| 356 | 109 | 356-1-A | | | NO Access | | |
| 356 | 110 | 356-1-A | | | NO Access | | |
| 356 | 111 | 356-1-A | | | NO Access | | |
| 356 | 112 | 356-1-A | | | NO Access | | |
| 356 | 113 | 356-1-A | | | NO Access | | |
| 356 | 114 | 356-1-A | | | NO Access | | |
| 356 | 115 | 356-1-A | | | NO Access | | |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| **356** | **116** | **356-1-A** | **1** | | **SUSPECT PCBS** | | **2** |
| 356 | 117 | 356-1-A | 8 | | INV | | 16 |
| 356 | 118 | 356-1-A | | | NO Access | | |
| 356 | 119 | 356-1-A | | | NO Access | | |
| 356 | 120 | 356-1-B | 0 | | INV | | 0 |
| 356 | 121 | 356-1-B | 0 | | INV | | 0 |
| 356 | 122 | 356-1-B | 4 | | INV | | 8 |
| 356 | 123 | 356-1-B | 1 | | INV | | 1 |
| 356 | 124 | 356-1-B | 7 | | INV | | 14 |
| 356 | 124A | 356-1-B | 1 | | INV | | 2 |
| 356 | Corr 125 | 356-1-B | 2 | | INV | | 4 |
| **356** | **Corr 126** | **356-1-B** | **4** | **2** | **INV** | **Phillips Econowatt** | **8** |
| 356 | Corr 127 | 356-1-B | 2 | | INV | | 4 |
| 356 | 128 | 356-1-B | 3 | | INV | | 12 |
| 356 | 129 | 356-1-B | 2 | | INV | | 4 |
| **356** | **130** | **356-1-B** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 356 | 132 | 356-1-B | 2 | | INV | | 6 |
| 356 | 133 | 356-1-B | 2 | | INV | | 8 |
| 356 | 134 | 356-1-B | 6 | | INV | | 12 |
| 356 | 135 | 356-1-B | 6 | | INV | | 12 |
| **356** | **135A** | **356-1-B** | **4** | **4** | **NO PCBs** | **Phillips Econowatt** | **8** |
| 356 | 136 | 356-1-B | | | No Access | | |
| 356 | 137 | 356-1-B | 0 | | INV | | 0 |
| 356 | 138 | 356-1-B | 2 | | INV | | 4 |
| 356 | 139 | 356-1-B | 3 | | INV | | 10 |
| 356 | 140 | 356-1-B | 5 | | INV | | 10 |
| **356** | **140A** | **356-1-B** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 356 | 141 | 356-1-C | | | No Access | | |
| 356 | 142 | 356-1-C | 4 | | INV | | 8 |
| 356 | 142A | 356-1-C | 4 | | INV | | 8 |
| 356 | 143 | 356-1-C | 0 | | INV | | 0 |
| **356** | **144** | **356-1-C** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 356 | 145 | 356-1-C | 2 | | INV | | 4 |
| 356 | Corr 146 | 356-1-C | 2 | | INV | | 4 |
| 356 | Corr 147 | 356-1-C | 4 | | INV | | 8 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 356 | Corr 148 | 356-1-C | 2 | | INV | | 4 |
| 356 | 149 | 356-1-C | 2 | | INV | | 4 |
| 356 | 151 | 356-1-C | 6 | | INV | | 12 |
| 356 | 152 | 356-1-C | 8 | | INV | | 16 |
| 356 | 153 | 356-1-C | 3 | | INV | | 6 |
| 356 | 154 | 356-1-C | 2 | | INV | | 4 |
| 356 | 155 | 356-1-C | 3 | | INV | | 6 |
| 356 | 156 | 356-1-C | 2 | | INV | | 4 |
| 356 | 157 | 356-1-C | 0 | | INV | | 0 |
| 356 | 158 | 356-1-C | 0 | | INV | | 0 |
| **356** | **159** | **356-1-C** | **8** | **8** | **NO PCBs** | **Phillips Econowatt** | **16** |
| 356 | 160 | 356-1-C | 0 | | INV | | 0 |
| 356 | 161 | 356-1-C | 8 | | INV | | 16 |
| 356 | 162 | 356-1-D | 8 | | INV | | 16 |
| 356 | 163 | 356-1-D | 0 | | INV | | 0 |
| **356** | **164** | **356-1-D** | **8** | **8** | **NO PCBs** | | **14** |
| 356 | Corr 165 | 356-1-D | 2 | | INV | | 8 |
| 356 | Corr 166 | 356-1-D | 4 | | INV | | 16 |
| 356 | Corr 167 | 356-1-D | 2 | | INV | | 8 |
| 356 | 168 | 356-1-D | 2 | | INV | | 4 |
| 356 | 169 | 356-1-D | 2 | | INV | | 8 |
| 356 | 170 | 356-1-D | 2 | | INV | | 4 |
| 356 | 171 | 356-1-D | 2 | | INV | | 4 |
| 356 | 172 | 356-1-D | 2 | | INV | | 8 |
| 356 | 173 | 356-1-D | 2 | | INV | | 8 |
| **356** | **174** | **356-1-D** | **4** | **4** | **NO PCBs** | **Phillips Alto** | **16** |
| 356 | 175 | 356-1-D | 10 | | INV | | 20 |
| 356 | 176 | 356-1-D | | | NO Access | | |
| 356 | 177 | 356-1-D | 0 | | INV | | 0 |
| 356 | 178 | 356-1-D | 2 | | INV | | 4 |
| **356** | **180** | **356-1-D** | **8** | **8** | **SUSPECT PCBS** | | **32** |
| 356 | 200 | 356-2-A | 2 | | INV | | 4 |
| 356 | 201 | 356-2-A | 0 | | INV | | 0 |
| 356 | 202 | 356-2-A | 0 | | INV | | 0 |
| 356 | 203 | 356-2-A | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 356 | 204 | 356-2-A | 0 | | INV | | 0 |
| 356 | Corr 205 | 356-2-A | 2 | | INV | | 5 |
| 356 | Corr 206 | 356-2-A | 4 | | INV | | 16 |
| 356 | Corr 207 | 356-2-A | 2 | | INV | | 5 |
| **356** | **208** | **356-2-A** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| **356** | **209** | **356-2-A** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 356 | 210 | 356-2-A | 2 | | INV | | 4 |
| 356 | 211 | 356-2-A | 2 | | INV | | 4 |
| 356 | 212 | 356-2-A | 2 | | INV | | 4 |
| 356 | 213 | 356-2-A | 2 | | INV | | 4 |
| 356 | 214 | 356-2-A | 2 | | INV | | 4 |
| 356 | 215 | 356-2-A | 3 | | INV | | 6 |
| 356 | 216 | 356-2-A | 2 | | INV | | 4 |
| 356 | 217 | 356-2-A | 2 | | INV | | 4 |
| 356 | 219 | 356-2-A | 3 | | INV | | 6 |
| 356 | 220 | 356-2-A | 3 | | INV | | 6 |
| 356 | Latrine | 356-2-A | 14 | | INV | | 28 |
| 356 | Latrine | 356-2-B | 14 | | INV | | 28 |
| 356 | 222 | 356-2-B | 0 | | INV | | 0 |
| 356 | 223 | 356-2-B | 0 | | INV | | 0 |
| 356 | 224 | 356-2-B | 2 | | INV | | 4 |
| 356 | 225 | 356-2-B | 3 | | INV | | 6 |
| 356 | Corr 226 | 356-2-B | 2 | | INV | | 4 |
| **356** | **Corr 227** | **356-2-B** | **6** | **3** | **NO PCBs** | **Phillips Econowatt** | **12** |
| 356 | Corr 228 | 356-2-B | 2 | | INV | | 3 |
| **356** | **229** | **356-2-B** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **3** |
| 356 | 230 | 356-2-B | 2 | | INV | | 4 |
| 356 | 231 | 356-2-B | 2 | | INV | | 4 |
| 356 | 232 | 356-2-B | 2 | | INV | | 4 |
| 356 | 233 | 356-2-B | 2 | | INV | | 4 |
| 356 | 234 | 356-2-B | 2 | | INV | | 4 |
| 356 | 235 | 356-2-B | 2 | | INV | | 4 |
| 356 | 236 | 356-2-B | 2 | | INV | | 4 |
| 356 | 237 | 356-2-B | 2 | | INV | | 4 |
| 356 | 238 | 356-2-B | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 356 | 239 | 356-2-B | 3 | | INV | | 6 |
| 356 | 240 | 356-2-B | 3 | | INV | | 6 |
| 356 | 241 | 356-2-C | 3 | | INV | | 6 |
| **356** | **242** | **356-2-C** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 356 | Corr 243 | 356-2-C | 2 | | INV | | 3 |
| 356 | Corr 244 | 356-2-C | 6 | | INV | | 10 |
| 356 | Corr 245 | 356-2-C | 2 | | INV | | 3 |
| 356 | 246 | 356-2-C | 2 | | INV | | 4 |
| 356 | 247 | 356-2-C | 3 | | INV | | 6 |
| 356 | 248 | 356-2-C | 2 | | INV | | 4 |
| 356 | 249 | 356-2-C | 2 | | INV | | 4 |
| 356 | 250 | 356-2-C | 2 | | INV | | 4 |
| 356 | 251 | 356-2-C | 2 | | INV | | 4 |
| 356 | 252 | 356-2-C | 2 | | INV | | 4 |
| **356** | **253** | **356-2-C** | **3** | **3** | **NO PCBs** | **Phillips/ GE** | **6** |
| 356 | 254 | 356-2-C | 3 | | INV | | 4 |
| 356 | 255 | 356-2-C | 2 | | INV | | 4 |
| 356 | 256 | 356-2-C | 2 | | INV | | 28 |
| 356 | 257 | 356-2-C | 0 | | INV | | 0 |
| 356 | 258 | 356-2-C | 2 | | INV | | 4 |
| 356 | 259 | 356-2-C | 0 | | INV | | 0 |
| 356 | 260 | 356-2-C | 3 | | INV | | 6 |
| 356 | 261 | 356-2-C | 14 | | INV | | 28 |
| 356 | 262 | 356-2-D | 3 | | INV | | 6 |
| 356 | 263 | 356-2-D | 3 | | INV | | 2 |
| 356 | Corr 264 | 356-2-D | 2 | | INV | | 6 |
| 356 | Corr 265 | 356-2-D | 6 | | INV | | 20 |
| 356 | Corr 266 | 356-2-D | 2 | | INV | | 2 |
| **356** | **267** | **356-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| **356** | **268** | **356-2-D** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 356 | 269 | 356-2-D | 2 | | INV | | 4 |
| 356 | 270 | 356-2-D | 2 | | INV | | 4 |
| 356 | 271 | 356-2-D | 2 | | INV | | 3 |
| 356 | 272 | 356-2-D | 2 | | INV | | 4 |
| **356** | **273** | **356-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 356 | 274 | 356-2-D | 3 | | INV | | 6 |
| 356 | 275 | 356-2-D | 2 | | INV | | 4 |
| 356 | 276 | 356-2-D | 2 | | INV | | 4 |
| 356 | 277 | 356-2-D | 2 | | INV | | 4 |
| 356 | 278 | 356-2-D | 0 | | INV | | 0 |
| 356 | 279 | 356-2-D | 0 | | INV | | 0 |
| 356 | 280 | 356-2-D | 0 | | INV | | 0 |
| 356 | 281 | 356-2-D | 2 | | INV | | 8 |
| 356 | 300 | 356-3-A | 2 | | INV | | 4 |
| 356 | 301 | 356-3-A | 0 | | INV | | 0 |
| 356 | 302 | 356-3-A | 0 | | INV | | 0 |
| 356 | 303 | 356-3-A | 2 | | INV | | 4 |
| 356 | 304 | 356-3-A | 0 | | INV | | 0 |
| 356 | Corr 305 | 356-3-A | 2 | | INV | | 6 |
| **356** | **Corr 306** | **356-3-A** | **4** | **1** | **NO PCBs** | **Phillips Alto** | **16** |
| 356 | Corr 307 | 356-3-A | 2 | | INV | | 5 |
| **356** | **308** | **356-3-A** | **3** | **1** | **NO PCBs** | **GE Ecolux** | **6** |
| 356 | 309 | 356-3-A | 2 | | INV | | 4 |
| 356 | 310 | 356-3-A | 2 | | INV | | 4 |
| 356 | 311 | 356-3-A | 2 | | INV | | 4 |
| 356 | 312 | 356-3-A | 2 | | INV | | 4 |
| 356 | 313 | 356-3-A | 2 | | INV | | 4 |
| 356 | 314 | 356-3-A | 2 | | INV | | 4 |
| 356 | 315 | 356-3-A | 3 | | INV | | 6 |
| 356 | 316 | 356-3-A | 2 | | INV | | 4 |
| 356 | 317 | 356-3-A | 2 | | INV | | 4 |
| 356 | 318 | 356-3-A | 14 | | INV | | 28 |
| 356 | 319 | 356-3-A | 3 | | INV | | 6 |
| **356** | **320** | **356-3-A** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **6** |
| 356 | 321 | 356-3-B | 14 | | INV | | 28 |
| 356 | 322 | 356-3-B | 2 | | INV | | 4 |
| 356 | 323 | 356-3-B | 0 | | INV | | 0 |
| 356 | 324 | 356-3-B | 0 | | INV | | 0 |
| 356 | 325 | 356-3-B | 2 | | INV | | 4 |
| 356 | Corr 326 | 356-3-B | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| **356** | **Corr 327** | **356-3-B** | **6** | **3** | **NO PCBs** | **GE Ecolux** | **12** |
| 356 | Corr 328 | 356-3-B | 2 | | INV | | 4 |
| 356 | 329 | 356-3-B | 2 | | INV | | 4 |
| 356 | 330 | 356-3-B | 3 | | INV | | 6 |
| 356 | 331 | 356-3-B | 2 | | INV | | 4 |
| 356 | 332 | 356-3-B | 2 | | INV | | 4 |
| 356 | 333 | 356-3-B | 2 | | INV | | 4 |
| **356** | **334** | **356-3-B** | **2** | **1** | **NO PCBs** | **Phillps** | **4** |
| 356 | 335 | 356-3-B | 2 | | INV | | 4 |
| 356 | 336 | 356-3-B | 3 | | INV | | 6 |
| 356 | 337 | 356-3-B | 2 | | INV | | 4 |
| 356 | 338 | 356-3-B | 2 | | INV | | 4 |
| 356 | 339 | 356-3-B | 3 | | INV | | 6 |
| 356 | 340 | 356-3-B | 3 | | INV | | 6 |
| 356 | 341 | 356-3-C | 3 | | INV | | 6 |
| 356 | 342 | 356-3-C | 3 | | INV | | 6 |
| 356 | Corr 343 | 356-3-C | 2 | | INV | | 3 |
| 356 | Corr 344 | 356-3-C | 6 | | INV | | 12 |
| 356 | Corr 345 | 356-3-C | 2 | | INV | | 3 |
| 356 | 346 | 356-3-C | 2 | | INV | | 4 |
| 356 | 347 | 356-3-C | 3 | | INV | | 6 |
| 356 | 348 | 356-3-C | 1 | | INV | | 2 |
| **356** | **349** | **356-3-C** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 356 | 350 | 356-3-C | 2 | | INV | | 4 |
| 356 | 351 | 356-3-C | 2 | | INV | | 4 |
| 356 | 352 | 356-3-C | 2 | | INV | | 4 |
| 356 | 353 | 356-3-C | 3 | | INV | | 6 |
| 356 | 354 | 356-3-C | 2 | | INV | | 4 |
| 356 | 355 | 356-3-C | 2 | | INV | | 4 |
| 356 | 356 | 356-3-C | 14 | | INV | | 28 |
| 356 | 357 | 356-3-C | 0 | | INV | | 0 |
| **356** | **358** | **356-3-C** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 356 | 359 | 356-3-C | 0 | | INV | | 0 |
| **356** | **360** | **356-3-C** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 356 | 361 | 356-3-D | 14 | | INV | | 28 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 356 | 362 | 356-3-D | | | NO Access | | |
| 356 | 363 | 356-3-D | | | NO Access | | |
| 356 | Corr 364 | 356-3-D | 2 | | INV | | 4 |
| **356** | **Corr 365** | **356-3-D** | **5** | **5** | **NO PCBs** | **Phillips Econowatt** | **10** |
| 356 | Corr 366 | 356-3-D | 2 | | INV | | 4 |
| 356 | 367 | 356-3-D | | | NO Access | | |
| 356 | 368 | 356-3-D | | | INV | | 4 |
| 356 | 369 | 356-3-D | | | INV | | 4 |
| 356 | 370 | 356-3-D | | | INV | | 4 |
| 356 | 371 | 356-3-D | | | INV | | 4 |
| **356** | **372** | **356-3-D** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 356 | 373 | 356-3-D | | | INV | | 4 |
| 356 | 374 | 356-3-D | | | INV | | 6 |
| 356 | 375 | 356-3-D | | | INV | | 4 |
| **356** | **376** | **356-3-D** | **2** | **2** | **NO PCBs** | **Phillips Alto** | **4** |
| 356 | 377 | 356-3-D | | | NO Access | | |
| 356 | 378 | 356-3-D | | | NO Access | | |
| 356 | 379 | 356-3-D | 0 | | INV | | |
| 356 | 380 | 356-3-D | | | NO Access | | |
| 356 | 380 | 356-3-D | | | NO Access | | |
| 357 | 100 | 357-1-A | 4 | | INV | | 8 |
| 357 | 101 | 357-1-A | 1 | | INV | | 2 |
| 357 | 102 | 357-1-A | 0 | | INV | | 0 |
| 357 | 103 | 357-1-A | 0 | | INV | | 0 |
| 357 | 104 | 357-1-A | 0 | | INV | | 0 |
| 357 | 105 | 357-1-A | 36 | | INV | | 75 |
| 357 | 106 | 357-1-A | 20 | | INV | | 80 |
| 357 | 107 | 357-1-A | 0 | | INV | | 0 |
| 357 | 108 | 357-1-A | 2 | | INV | | 8 |
| 357 | 108A | 357-1-A | 2 | | INV | | 1 |
| 357 | 109 | 357-1-B | 3 | | INV | | 6 |
| 357 | 109A | 357-1-A | 3 | | INV | | 6 |
| 357 | 110 | 357-1-A | 7 | | INV | | 14 |
| 357 | 111 | 357-1-B | 5 | | INV | | 10 |
| 357 | 112 | 357-1-B | 3 | | INV | | 6 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 357 | 112A | 357-1-B | 3 | | INV | | 6 |
| 357 | 113 | 357-1-B | 0 | | INV | | 0 |
| 357 | 114 | 357-1-B | 0 | | INV | | 0 |
| 357 | 115 | 357-1-B | 1 | | INV | | 4 |
| 357 | 116 | 357-1-B | 1 | | INV | | 4 |
| 357 | 117 | 357-1-B | 8 | | INV | | 32 |
| **357** | **117A** | 357-1-B | **7** | **7** | **NO PCBs** | **Phillips Econowatt** | **14** |
| 357 | 118 | 357-1-A | 14 | | INV | | 56 |
| 357 | 118A | 357-1-B | 4 | | INV | | 16 |
| **357** | **118B** | 357-1-B | **9** | **9** | **NO PCBs** | **Phillips Econowatt** | **36** |
| 357 | 119 | 357-1-B | 4 | | INV | | 8 |
| 357 | 120 | 357-1-B | 1 | | INV | | 2 |
| **357** | **120A** | **357-1-A** | **1** | **1** | **SUSPECT PCBS** | | **2** |
| **357** | **120B** | 357-1-B | **1** | **1** | **SUSPECT PCBS** | | **2** |
| 357 | 121 | 357-1-C | | | No Access | | |
| **357** | **122** | 357-1-C | **8** | **8** | **NO PCBs** | **Phillips Econowatt** | **16** |
| 357 | 123 | 357-1-C | 0 | | INV | | 0 |
| 357 | 124 | 357-1-C | 2 | | INV | | 8 |
| 357 | 125 | 357-1-C | 2 | | INV | | 4 |
| 357 | Corr 126 | 357-1-C | 2 | | INV | | 8 |
| 357 | 127 | 357-1-C | | | No Access | | |
| 357 | 128 | 357-1-C | 2 | | INV | | 8 |
| 357 | 129 | 357-1-C | 4 | | INV | | 12 |
| 357 | Corr 130 | 357-1-C | 4 | | INV | | 7 |
| 357 | 131 | 357-1-C | 8 | | INV | | 32 |
| 357 | 132 | 357-1-C | 2 | | INV | | 8 |
| 357 | 133 | 357-1-C | 2 | | INV | | 8 |
| 357 | 134 | 357-1-C | 2 | | INV | | 8 |
| **357** | **Corr 135** | 357-1-C | **2** | **2** | **2 Suspect, Universal** | **Phillips Econowatt** | **3** |
| 357 | 136 | 357-1-C | 2 | | INV | | 8 |
| 357 | 137 | 357-1-C | 1 | | INV | | 4 |
| 357 | 138 | 357-1-C | 8 | | INV | | 30 |
| 357 | 139 | 357-1-C | 0 | | INV | | 0 |
| 357 | 140 | 357-1-C | 6 | | INV | | 24 |
| 357 | 140A | 357-1-C | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 357 | 141 | 357-1-D | 6 | | INV | | 12 |
| 357 | 141A | 357-1-D | | | No Access | | |
| 357 | 142 | 357-1-D | 0 | | INV | | 0 |
| 357 | 143 | 357-1-D | 8 | | INV | | 16 |
| 357 | 144 | 357-1-D | | | No Access | | |
| **357** | **Corr 145** | 357-1-D | **2** | **2** | **2 Suspect, Universal** | **Phillips Econowatt** | **2** |
| 357 | 146 | 357-1-D | 2 | | INV | | 8 |
| 357 | 147 | 357-1-D | 2 | | INV | | 8 |
| 357 | 148 | 357-1-D | 2 | | INV | | 8 |
| **357** | **149** | 357-1-D | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| **357** | **150** | 357-1-D | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **8** |
| 357 | 151 | 357-1-D | 2 | | INV | | 4 |
| 357 | 152 | 357-1-D | 4 | | INV | | 16 |
| 357 | Corr 153 | 357-1-D | 3 | | INV | | 6 |
| 357 | 154 | 357-1-D | 4 | | INV | | 16 |
| 357 | Corr 155 | 357-1-D | 2 | | INV | | 4 |
| 357 | 156 | 357-1-D | | | No Access | | |
| 357 | 157 | 357-1-D | 0 | | INV | | 0 |
| **357** | **158** | 357-1-D | **2** | **2** | **1 Suspect, Universal** | **Phillips Econowatt** | **4** |
| 357 | 159 | 357-1-D | | | No Access | | |
| 357 | 160 | 357-1-D | | | No Access | | |
| 357 | 200 | 357-2-A | 2 | | INV | | 4 |
| 357 | 201 | 357-2-A | 0 | | INV | | 0 |
| 357 | 202 | 357-2-A | 0 | | INV | | 0 |
| 357 | 203 | 357-2-A | 3 | | INV | | 6 |
| 357 | 204 | 357-2-A | 0 | | INV | | 0 |
| 357 | Corr 205 | 357-2-A | 2 | | INV | | 3 |
| 357 | Corr 206 | 357-2-A | 5 | | INV | | 10 |
| 357 | Corr 207 | 357-2-A | 2 | | INV | | 3 |
| 357 | 208 | 357-2-A | 2 | | INV | | 3 |
| 357 | 209 | 357-2-A | 2 | | INV | | 4 |
| 357 | 210 | 357-2-A | 2 | | INV | | 4 |
| 357 | 211 | 357-2-A | 2 | | INV | | 4 |
| 357 | 212 | 357-2-A | 2 | | INV | | 4 |
| **357** | **213** | **357-2-A** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 357 | 214 | 357-2-A | 2 | | INV | | 4 |
| 357 | 215 | 357-2-A | 3 | | INV | | 6 |
| 357 | 216 | 357-2-A | 2 | | INV | | 4 |
| 357 | 217 | 357-2-A | 2 | | INV | | 4 |
| 357 | 218 | 357-2-A | 14 | | INV | | 28 |
| 357 | 219 | 357-2-A | 3 | | INV | | 6 |
| **357** | **220** | **357-2-A** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **6** |
| 357 | 221 | 357-2-B | 14 | | INV | | 228 |
| 357 | 222 | 357-2-B | 2 | | INV | | 4 |
| 357 | 223 | 357-2-B | 0 | | INV | | 0 |
| 357 | 224 | 357-2-B | 0 | | INV | | 0 |
| 357 | 225 | 357-2-B | 2 | | INV | | 4 |
| 357 | Corr 226 | 357-2-B | 2 | | INV | | 3 |
| 357 | Corr 227 | 357-2-B | 6 | | INV | | 12 |
| 357 | Corr 228 | 357-2-B | 2 | | INV | | 4 |
| 357 | 229 | 357-2-B | 2 | | INV | | 4 |
| **357** | **230** | **357-2-B** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 357 | 231 | 357-2-B | 2 | | INV | | 4 |
| 357 | 232 | 357-2-B | 2 | | INV | | 4 |
| 357 | 233 | 357-2-B | 2 | | INV | | 4 |
| 357 | 234 | 357-2-B | 2 | | INV | | 4 |
| **357** | **235** | **357-2-B** | **2** | **2** | **NO PCBs** | **GE/Phillips** | **4** |
| 357 | 236 | 357-2-B | 3 | | INV | | 6 |
| 357 | 237 | 357-2-B | 2 | | INV | | 4 |
| 357 | 238 | 357-2-B | 2 | | INV | | 4 |
| 357 | 239 | 357-2-B | 3 | | INV | | 6 |
| 357 | 240 | 357-2-B | 3 | | INV | | 6 |
| 357 | 241 | 357-2-C | 3 | | INV | | 6 |
| 357 | 242 | 357-2-C | 2 | | INV | | 4 |
| 357 | Corr 243 | 357-2-C | 2 | | INV | | 4 |
| 357 | Corr 244 | 357-2-C | 6 | | INV | | 12 |
| 357 | Corr 245 | 357-2-C | 2 | | INV | | 4 |
| 357 | 246 | 357-2-C | 2 | | INV | | 4 |
| **357** | **247** | **357-2-C** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 357 | 248 | 357-2-C | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 357 | 249 | 357-2-C | | | No Access | | |
| 357 | 250 | 357-2-C | 2 | | INV | | 4 |
| **357** | **251** | **357-2-C** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **3** |
| 357 | 252 | 357-2-C | 2 | | INV | | 4 |
| 357 | 253 | 357-2-C | | | No Access | | |
| 357 | 254 | 357-2-C | 2 | | INV | | 4 |
| 357 | 255 | 357-2-C | 2 | | INV | | 4 |
| 357 | 256 | 357-2-C | 14 | | INV | | 28 |
| 357 | 257 | 357-2-C | 0 | | INV | | 0 |
| **357** | **258** | **357-2-C** | **2** | **2** | **NO PCBs** | **GE/Phillips** | **4** |
| 357 | 259 | 357-2-C | 0 | | INV | | 0 |
| 357 | 260 | 357-2-C | 3 | | INV | | 6 |
| 357 | 261 | 357-2-D | 14 | | INV | | 28 |
| 357 | 262 | 357-2-D | 3 | | INV | | 6 |
| 357 | 263 | 357-2-D | 3 | | INV | | 6 |
| 357 | Corr 264 | 357-2-D | 2 | | INV | | 4 |
| 357 | Corr 265 | 357-2-D | 5 | | INV | | 10 |
| 357 | Corr 266 | 357-2-D | 2 | | INV | | 3 |
| 357 | 267 | 357-2-D | 2 | | INV | | 4 |
| 357 | 268 | 357-2-D | 3 | | INV | | 6 |
| 357 | 269 | 357-2-D | 2 | | INV | | 4 |
| 357 | 270 | 357-2-D | 2 | | INV | | 4 |
| **357** | **271** | **357-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 357 | 272 | 357-2-D | 2 | | INV | | 4 |
| 357 | 273 | 357-2-D | 2 | | INV | | 4 |
| **357** | **274** | **357-2-D** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 357 | 275 | 357-2-D | 2 | | INV | | 2 |
| 357 | 276 | 357-2-D | 2 | | INV | | 4 |
| **357** | **277** | **357-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 357 | 278 | 357-2-D | 0 | | INV | | 0 |
| 357 | 279 | 357-2-D | 0 | | INV | | 0 |
| 357 | 280 | 357-2-D | 0 | | INV | | 0 |
| 357 | 281 | 357-2-D | 2 | | INV | | 4 |
| 357 | 300 | 357-3-A | 2 | | INV | | 4 |
| 357 | 301 | 357-3-A | 0 | | INV | | 0 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| **357** | 302 | 357-3-A | 0 | | INV | | 0 |
| 357 | 303 | 357-3-A | 1 | | INV | | 2 |
| 357 | 304 | 357-3-A | 0 | | INV | | 0 |
| 357 | Corr 305 | 357-3-A | 2 | | INV | | 4 |
| 357 | Corr 306 | 357-3-A | 5 | | INV | | 10 |
| 357 | Corr 307 | 357-3-A | 2 | | INV | | 4 |
| 357 | 308 | 357-3-A | 2 | | INV | | 4 |
| 357 | 309 | 357-3-A | 2 | | INV | | 3 |
| 357 | **310** | **357-3-A** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 357 | 311 | 357-3-A | 2 | | INV | | 4 |
| 357 | 312 | 357-3-A | 2 | | INV | | 4 |
| 357 | 313 | 357-3-A | 2 | | INV | | 4 |
| 357 | 314 | 357-3-A | 2 | | INV | | 4 |
| 357 | **315** | **357-3-A** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 357 | 316 | 357-3-A | 2 | | INV | | 4 |
| 357 | 317 | 357-3-A | 2 | | INV | | 4 |
| 357 | 318 | 357-3-A | 14 | | INV | | 28 |
| 357 | 319 | 357-3-A | 3 | | INV | | 6 |
| 357 | 320 | 357-3-A | 3 | | INV | | 4 |
| 357 | 321 | 357-3-B | 14 | | INV | | 28 |
| 357 | 322 | 357-3-B | 2 | | INV | | 4 |
| **357** | 323 | 357-3-B | 0 | | INV | | 0 |
| 357 | 324 | 357-3-B | | | No Access | | |
| 357 | 325 | 357-3-B | 3 | | INV | | 6 |
| 357 | Corr 326 | 357-3-B | 2 | | INV | | 4 |
| **357** | Corr 327 | 357-3-B | 6 | | INV | | 12 |
| 357 | Corr 328 | 357-3-B | 2 | | INV | | 4 |
| 357 | 329 | 357-3-B | 2 | | INV | | 3 |
| 357 | 330 | 357-3-B | 2 | | INV | | 4 |
| 357 | 331 | 357-3-B | 2 | | INV | | 4 |
| 357 | 332 | 357-3-B | 2 | | INV | | 4 |
| 357 | 333 | 357-3-B | 2 | | INV | | 4 |
| 357 | 334 | 357-3-B | 2 | | INV | | 4 |
| 357 | 335 | 357-3-B | 2 | | INV | | 4 |
| 357 | **336** | **357-3-B** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **2** |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| **357** | 337 | 357-3-B | 2 | | INV | | 4 |
| 357 | 338 | 357-3-B | 2 | | INV | | 4 |
| 357 | 339 | 357-3-B | 3 | | INV | | 6 |
| **357** | **340** | **357-3-B** | **3** | **3** | **NO PCBs** | **GE/ Phillips** | **6** |
| 357 | 341 | 357-3-C | 2 | | INV | | 4 |
| 357 | 342 | 357-3-C | 3 | | INV | | 6 |
| 357 | Corr 343 | 357-3-C | 2 | | INV | | 4 |
| 357 | Corr 344 | 357-3-C | 6 | | INV | | 12 |
| 357 | Corr 345 | 357-3-C | 2 | | INV | | 4 |
| 357 | 346 | 357-3-C | 2 | | INV | | 4 |
| 357 | 347 | 357-3-C | 3 | | INV | | 6 |
| 357 | 348 | 357-3-C | 2 | | INV | | 4 |
| 357 | 349 | 357-3-C | 2 | | INV | | 4 |
| 357 | **350** | **357-3-C** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **2** |
| 357 | 351 | 357-3-C | 2 | | INV | | 4 |
| 357 | 352 | 357-3-C | 2 | | INV | | 4 |
| 357 | **353** | **357-3-C** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 357 | 354 | 357-3-C | 2 | | INV | | 4 |
| **357** | 355 | 357-3-C | 2 | | INV | | 4 |
| 357 | 356 | 357-3-C | 14 | | INV | | 28 |
| 357 | 357 | 357-3-C | 2 | | INV | | 4 |
| 357 | 358 | 357-3-C | 0 | | INV | | 0 |
| 357 | 359 | 357-3-C | 0 | | INV | | 0 |
| 357 | 360 | 357-3-C | 3 | | INV | | 6 |
| 357 | 361 | 357-3-D | 14 | | INV | | 28 |
| **357** | 362 | 357-3-D | 3 | | INV | | 6 |
| 357 | 363 | 357-3-D | 3 | | INV | | 4 |
| 357 | Corr 364 | 357-3-D | 2 | | INV | | 4 |
| 357 | Corr 365 | 357-3-D | 5 | | INV | | 10 |
| 357 | Corr 366 | 357-3-D | 2 | | INV | | 4 |
| 357 | 367 | 357-3-D | 1 | | INV | | 2 |
| 357 | **368** | **357-3-D** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **5** |
| 357 | 369 | 357-3-D | 2 | | INV | | 4 |
| 357 | 370 | 357-3-D | 2 | | INV | | 4 |
| 357 | 371 | 357-3-D | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 357 | 372 | 357-3-D | 2 | | INV | | 4 |
| 357 | 373 | 357-3-D | 2 | | INV | | 4 |
| 357 | 374 | 357-3-D | 3 | | INV | | 4 |
| 357 | **375** | **357-3-D** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **2** |
| 357 | 376 | 357-3-D | 2 | | INV | | 4 |
| 357 | 377 | 357-3-D | 2 | | INV | | 4 |
| 357 | 378 | 357-3-D | 0 | | INV | | 0 |
| 357 | 379 | 357-3-D | 0 | | INV | | 0 |
| 357 | 380 | 357-3-D | 0 | | INV | | 0 |
| 357 | 381 | 357-3-D | 2 | | INV | | 4 |
| 358 | 100 | 358-1-A | | | No Access | | |
| 358 | 101 | 358-1-A | 8 | | INV | | 24 |
| 358 | 102 | 358-1-A | 0 | | INV | | 0 |
| 358 | 103 | 358-1-A | 2 | | INV | | 4 |
| 358 | 104 | 358-1-A | 4 | | INV | | 10 |
| **358** | **Corr 105** | **358-1-A** | **2** | **2** | **NO PCBs** | **Sylvania Octron** | **4** |
| 358 | Corr 106 | 358-1-A | 4 | | INV | | 8 |
| 358 | Corr 107 | 358-1-A | 2 | | INV | | 4 |
| 358 | 108 | 358-1-A | 3 | | INV | | 12 |
| 358 | 109 | 358-1-A | 3 | | INV | | 12 |
| 358 | 110 | 358-1-A | 1 | | INV | | 4 |
| 358 | 111 | 358-1-A | 4 | | INV | | 8 |
| 358 | 112 | 358-1-A | 3 | | INV | | 12 |
| 358 | 114 | 358-1-A | 3 | | INV | | 12 |
| 358 | 115 | 358-1-A | 2 | | INV | | 8 |
| **358** | **116** | **358-1-A** | **2** | **2** | **SUSPECT PCBS** | | **4** |
| **358** | **117** | **358-1-A** | **5** | **5** | **NO PCBs** | **Sylvania Octron** | **10** |
| 358 | 118 | 358-1-A | 0 | | INV | | 0 |
| **358** | **119** | **358-1-A** | **6** | **4** | **NO PCBs** | **GE Ecolux** | **12** |
| 358 | 119A | 358-1-A | 2 | | INV | | 4 |
| 358 | 120 | 358-1-B | 0 | | INV | | 0 |
| 358 | 121 | 358-1-B | 0 | | INV | | 0 |
| 358 | 122 | 358-1-B | 6 | | INV | | 14 |
| 358 | 123 | 358-1-B | 0 | | INV | | 0 |
| 358 | 124 | 358-1-B | 10 | | INV | | 20 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | Corr 125 | 358-1-B | 2 | | INV | | 4 |
| 358 | Corr 126 | 358-1-B | 4 | | INV | | 8 |
| **358** | **Corr 127** | **358-1-B** | **2** | **2** | **NO PCBs** | **Sylvania Octron** | **4** |
| 358 | 128 | 358-1-B | 5 | | INV | | 10 |
| 358 | 129 | 358-1-B | 2 | | INV | | 8 |
| **358** | **130** | **358-1-B** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | 132 | 358-1-B | 4 | | INV | | 12 |
| 358 | 134 | 358-1-B | 6 | | INV | | 24 |
| 358 | 135 | 358-1-B | 6 | | INV | | 24 |
| 358 | 136 | 358-1-B | | | No Access | | |
| 358 | 137 | 358-1-B | 0 | | INV | | 0 |
| 358 | 138 | 358-1-B | 2 | | INV | | 4 |
| 358 | 139 | 358-1-B | 2 | | INV | | 4 |
| **358** | **140** | **358-1-B** | **8** | **4** | **NO PCBs** | **Phillips Econowatt** | **16** |
| 358 | 141 | 358-1-C | | | No Access | | |
| 358 | 142 | 358-1-C | 8 | | INV | | 16 |
| 358 | 143 | 358-1-C | 0 | | INV | | 0 |
| 358 | 144 | 358-1-C | 2 | | INV | | 4 |
| **358** | **145** | **358-1-C** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | Corr 146 | 358-1-C | 2 | | INV | | 4 |
| 358 | Corr 147 | 358-1-C | 4 | | INV | | 8 |
| **358** | **Corr 148** | **358-1-C** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 149 | 358-1-C | 4 | | INV | | 12 |
| 358 | 151 | 358-1-C | 4 | | INV | | 8 |
| 358 | 152 | 358-1-C | 4 | | INV | | 8 |
| 358 | 153 | 358-1-C | 2 | | INV | | 4 |
| 358 | 154 | 358-1-C | 2 | | INV | | 4 |
| 358 | 155 | 358-1-C | 3 | | INV | | 6 |
| **358** | **156** | **358-1-C** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **2** |
| 358 | 157 | 358-1-C | 0 | | INV | | 0 |
| 358 | 158 | 358-1-C | 0 | | INV | | 0 |
| 358 | 159 | 358-1-C | 4 | | INV | | 8 |
| 358 | 160 | 358-1-C | | | No Access | | |
| 358 | 161A | 358-1-C | | | No Access | | |
| 358 | 161 | 358-1-C | 6 | | INV | | 12 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 162 | 358-1-D | 6 | | INV | | 12 |
| 358 | 163 | 358-1-D | 0 | | INV | | 0 |
| 358 | 164 | 358-1-D | 10 | | INV | | 20 |
| **358** | **Corr 165** | **358-1-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | Corr 166 | 358-1-D | 4 | | INV | | 13 |
| 358 | Corr 167 | 358-1-D | 2 | | INV | | 4 |
| 358 | 168 | 358-1-D | 3 | | INV | | 6 |
| 358 | 169 | 358-1-D | 3 | | INV | | 6 |
| 358 | 170 | 358-1-D | 2 | | INV | | 4 |
| 358 | 171 | 358-1-D | 2 | | INV | | 4 |
| 358 | 172 | 358-1-D | 2 | | INV | | 4 |
| 358 | 173 | 358-1-D | 2 | | INV | | 8 |
| **358** | **174** | **358-1-D** | **5** | **5** | **NO PCBs** | **Phillips Econowatt** | **10** |
| 358 | 175 | 358-1-D | 4 | | INV | | 8 |
| 358 | 176 | 358-1-D | | | No Access | | |
| 358 | 177 | 358-1-D | 0 | | INV | | 0 |
| 358 | 178 | 358-1-D | 2 | | INV | | 4 |
| 358 | 179 | 358-1-D | | | No Access | | |
| 358 | 180 | 358-1-D | | | No Access | | |
| 358 | 200 | 358-2-A | 2 | | INV | | 4 |
| 358 | 201 | 358-2-A | 0 | | INV | | 0 |
| 358 | 202 | 358-2-A | 0 | | INV | | 0 |
| 358 | 203 | 358-2-A | 2 | | INV | | 4 |
| 358 | 204 | 358-2-A | 0 | | INV | | 0 |
| 358 | Corr 205 | 358-2-A | 2 | | INV | | 3 |
| 358 | Corr 206 | 358-2-A | 5 | | INV | | 10 |
| 358 | Corr 207 | 358-2-A | 2 | | INV | | 4 |
| **358** | **208** | **358-2-A** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | 209 | 358-2-A | 2 | | INV | | 4 |
| 358 | 210 | 358-2-A | 2 | | INV | | 4 |
| 358 | 211 | 358-2-A | 2 | | INV | | 4 |
| 358 | 212 | 358-2-A | 2 | | INV | | 4 |
| 358 | 213 | 358-2-A | 2 | | INV | | 4 |
| **358** | **214** | **358-2-A** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **2** |
| **358** | **215** | **358-2-A** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 216 | 358-2-A | 2 | | INV | | 4 |
| 358 | 217 | 358-2-A | 2 | | INV | | 4 |
| 358 | 218 | 358-2-A | 14 | | INV | | 28 |
| 358 | 219 | 358-2-A | 3 | | INV | | 6 |
| 358 | 220 | 358-2-A | 3 | | INV | | 6 |
| **358** | **221** | **358-2-B** | **14** | **3** | **NO PCBs** | **GE Ecolux** | **28** |
| 358 | 222 | 358-2-B | 0 | | INV | | 0 |
| 358 | 223 | 358-2-B | 3 | | INV | | 9 |
| 358 | 224 | 358-2-B | 0 | | INV | | 0 |
| **358** | **225** | **358-2-B** | **3** | **3** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | Corr 226 | 358-2-B | 2 | | INV | | 4 |
| 358 | Corr 227 | 358-2-B | 8 | | INV | | 16 |
| 358 | Corr 228 | 358-2-B | 2 | | INV | | 4 |
| 358 | 229 | 358-2-B | 2 | | INV | | 4 |
| 358 | 230 | 358-2-B | 2 | | INV | | 4 |
| **358** | **231** | **358-2-B** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 232 | 358-2-B | 2 | | INV | | 4 |
| **358** | **233** | **358-2-B** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 234 | 358-2-B | 2 | | INV | | 4 |
| 358 | 235 | 358-2-B | 2 | | INV | | 4 |
| **358** | **236** | **358-2-B** | **3** | **2** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | 237 | 358-2-B | 2 | | INV | | 4 |
| 358 | 238 | 358-2-B | 2 | | INV | | 4 |
| 358 | 239 | 358-2-B | 3 | | INV | | 6 |
| 358 | 240 | 358-2-B | 3 | | INV | | 6 |
| **358** | **241** | **358-2-C** | **3** | **2** | **NO PCBs** | **Phillips Econowatt** | **6** |
| 358 | 242 | 358-2-C | 3 | | INV | | 6 |
| 358 | Corr 243 | 358-2-C | 2 | | INV | | 4 |
| 358 | Corr 244 | 358-2-C | 6 | | INV | | 11 |
| 358 | Corr 245 | 358-2-C | 2 | | INV | | 4 |
| 358 | 246 | 358-2-C | 2 | | INV | | 4 |
| 358 | 247 | 358-2-C | 3 | | INV | | 6 |
| 358 | 248 | 358-2-C | 2 | | INV | | 4 |
| 358 | 249 | 358-2-C | 2 | | INV | | 4 |
| 358 | 250 | 358-2-C | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 251 | 358-2-C | 2 | | INV | | 4 |
| 358 | 252 | 358-2-C | 2 | | INV | | 4 |
| **358** | **253** | **358-2-C** | **3** | **3** | **NO PCBs** | **GE Ecolux** | **6** |
| 358 | 254 | 358-2-C | 2 | | INV | | 4 |
| 358 | 255 | 358-2-C | 2 | | INV | | 4 |
| 358 | 256 | 358-2-C | 14 | | INV | | 28 |
| 358 | 257 | 358-2-C | 0 | | INV | | 0 |
| **358** | **258** | **358-2-C** | **2** | **2** | **NO PCBs** | **GE Ecolux** | **4** |
| 358 | 259 | 358-2-C | 0 | | INV | | 0 |
| 358 | 260 | 358-2-C | 3 | | INV | | 6 |
| 358 | 261 | 358-2-D | 14 | | INV | | 28 |
| 358 | 262 | 358-2-D | 3 | | INV | | 6 |
| 358 | 263 | 358-2-D | 3 | | INV | | 6 |
| 358 | Corr 264 | 358-2-D | 2 | | INV | | 4 |
| 358 | Corr 265 | 358-2-D | 5 | | INV | | 10 |
| 358 | Corr 266 | 358-2-D | 2 | | INV | | 3 |
| **358** | **267** | **358-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 268 | 358-2-D | 3 | | INV | | 6 |
| 358 | 269 | 358-2-D | 2 | | INV | | 4 |
| **358** | **270** | **358-2-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 271 | 358-2-D | 2 | | INV | | 4 |
| 358 | 272 | 358-2-D | 2 | | INV | | 4 |
| 358 | 273 | 358-2-D | 2 | | INV | | 4 |
| 358 | 274 | 358-2-D | 3 | | INV | | 6 |
| 358 | 275 | 358-2-D | 2 | | INV | | 4 |
| 358 | 276 | 358-2-D | 2 | | INV | | 4 |
| 358 | 277 | 358-2-D | 2 | | INV | | 4 |
| 358 | 278 | 358-2-D | 0 | | INV | | 0 |
| 358 | 279 | 358-2-D | 0 | | INV | | 0 |
| 358 | 280 | 358-2-D | 0 | | INV | | 0 |
| 358 | 281 | 358-2-D | 2 | | INV | | 4 |
| 358 | 300 | 358-3-A | 2 | | INV | | 4 |
| 358 | 301 | 358-3-A | 0 | | INV | | 0 |
| 358 | 302 | 358-3-A | 0 | | INV | | 0 |
| **358** | **303** | **358-3-A** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 304 | 358-3-A | 0 | | INV | | 0 |
| 358 | Corr 305 | 358-3-A | 2 | | INV | | 2 |
| 358 | Corr 306 | 358-3-A | 4 | | INV | | 5 |
| 358 | Corr 307 | 358-3-A | 2 | | INV | | 2 |
| **358** | **308** | **358-3-A** | **3** | **3** | **INV** | **Phillips Econowatt** | **4** |
| 358 | 309 | 358-3-A | 2 | | INV | | 4 |
| 358 | 310 | 358-3-A | 2 | | INV | | 4 |
| **358** | **311** | **358-3-A** | **2** | **2** | **INV** | **Phillips Econowatt** | **4** |
| 358 | 312 | 358-3-A | 2 | | INV | | 4 |
| 358 | 313 | 358-3-A | 2 | | INV | | 4 |
| 358 | 314 | 358-3-A | 2 | | INV | | 4 |
| 358 | 315 | 358-3-A | 3 | | INV | | 6 |
| 358 | 316 | 358-3-A | 2 | | INV | | 4 |
| 358 | 317 | 358-3-A | 2 | | INV | | 4 |
| 358 | 318 | 358-3-A | 14 | | INV | | 28 |
| 358 | 319 | 358-3-A | 3 | | INV | | 5 |
| 358 | 320 | 358-3-A | 3 | | INV | | 5 |
| 358 | 321 | 358-3-B | 14 | | INV | | 28 |
| 358 | 322 | 358-3-B | 2 | | INV | | 4 |
| 358 | 323 | 358-3-B | 0 | | INV | | 0 |
| 358 | 324 | 358-3-B | 0 | | INV | | 0 |
| 358 | 325 | 358-3-B | 3 | | INV | | 6 |
| 358 | Corr 326 | 358-3-B | 2 | | INV | | 3 |
| 358 | Coor 327 | 358-3-B | 6 | | INV | | 12 |
| 358 | Coor 328 | 358-3-B | 2 | | INV | | 2 |
| 358 | 329 | 358-3-B | 2 | | INV | | 4 |
| 358 | 330 | 358-3-B | 3 | | INV | | 6 |
| 358 | 331 | 358-3-B | 2 | | INV | | 4 |
| 358 | 332 | 358-3-B | 2 | | INV | | 4 |
| 358 | 333 | 358-3-B | 2 | | INV | | 4 |
| **358** | **334** | **358-3-B** | **2** | | **NO PCBs** | **GE/Phillips** | **4** |
| 358 | 335 | 358-3-B | 2 | | INV | | 4 |
| 358 | 336 | 358-3-B | 3 | | INV | | 6 |
| 358 | 337 | 358-3-B | 2 | | INV | | 4 |
| 358 | 338 | 358-3-B | 2 | | INV | | 4 |

| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 339 | 358-3-B | 3 | | INV | | 6 |
| **358** | **340** | **358-3-B** | **3** | | **NO PCBs** | **GE/Phillips** | **6** |
| 358 | 341 | 358-3-C | 3 | | INV | | 6 |
| 358 | 342 | 358-3-C | 3 | | INV | | 6 |
| 358 | Corr 343 | 358-3-C | 2 | | INV | | 3 |
| **358** | **Corr 344** | **358-3-C** | **6** | **1** | **NO PCBs** | **GE Ecolux** | **12** |
| 358 | Corr 345 | 358-3-C | 2 | | INV | | 3 |
| 358 | 346 | 358-3-C | 2 | | INV | | 4 |
| **358** | **347** | **358-3-C** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **6** |
| 358 | 348 | 358-3-C | 2 | | INV | | 4 |
| 358 | 349 | 358-3-C | 2 | | INV | | 4 |
| 358 | 350 | 358-3-C | 2 | | INV | | 4 |
| 358 | 351 | 358-3-C | 2 | | INV | | 4 |
| 358 | 352 | 358-3-C | 2 | | INV | | 4 |
| 358 | 353 | 358-3-C | 3 | | INV | | 6 |
| **358** | **354** | **358-3-C** | **2** | **2** | **No PCBs** | **GE/Phillips** | **4** |
| 358 | 355 | 358-3-C | 2 | | INV | | 4 |
| 358 | 356 | 358-3-C | 14 | | INV | | 28 |
| 358 | 357 | 358-3-C | 0 | | INV | | 0 |
| 358 | 358 | 358-3-C | 2 | | INV | | 4 |
| 358 | 359 | 358-3-C | 0 | | INV | | 0 |
| 358 | 360 | 358-3-C | | | No Access | | |
| **358** | **361** | **358-3-D** | **14** | **4** | **NO PCBs** | **Phillips Econowatt** | **28** |
| 358 | 362 | 358-3-D | 3 | | INV | | 6 |
| 358 | 363 | 358-3-D | 3 | | INV | | 6 |
| 358 | Corr 364 | 358-3-D | 2 | | INV | | 4 |
| 358 | Corr 365 | 358-3-D | 5 | | INV | | 10 |
| 358 | Corr 366 | 358-3-D | 2 | | INV | | 4 |
| 358 | 367 | 358-3-D | 2 | | INV | | 4 |
| **358** | **368** | **358-3-D** | **3** | **3** | **NO PCBs** | **GE/Phillips** | **6** |
| 358 | 369 | 358-3-D | 2 | | INV | | 4 |
| 358 | 370 | 358-3-D | 2 | | INV | | 4 |
| 358 | 371 | 358-3-D | 2 | | INV | | 4 |
| 358 | 372 | 358-3-D | 2 | | INV | | 4 |
| 358 | 373 | 358-3-D | 2 | | INV | | 4 |

Schofield Barracks Quad C Inspection
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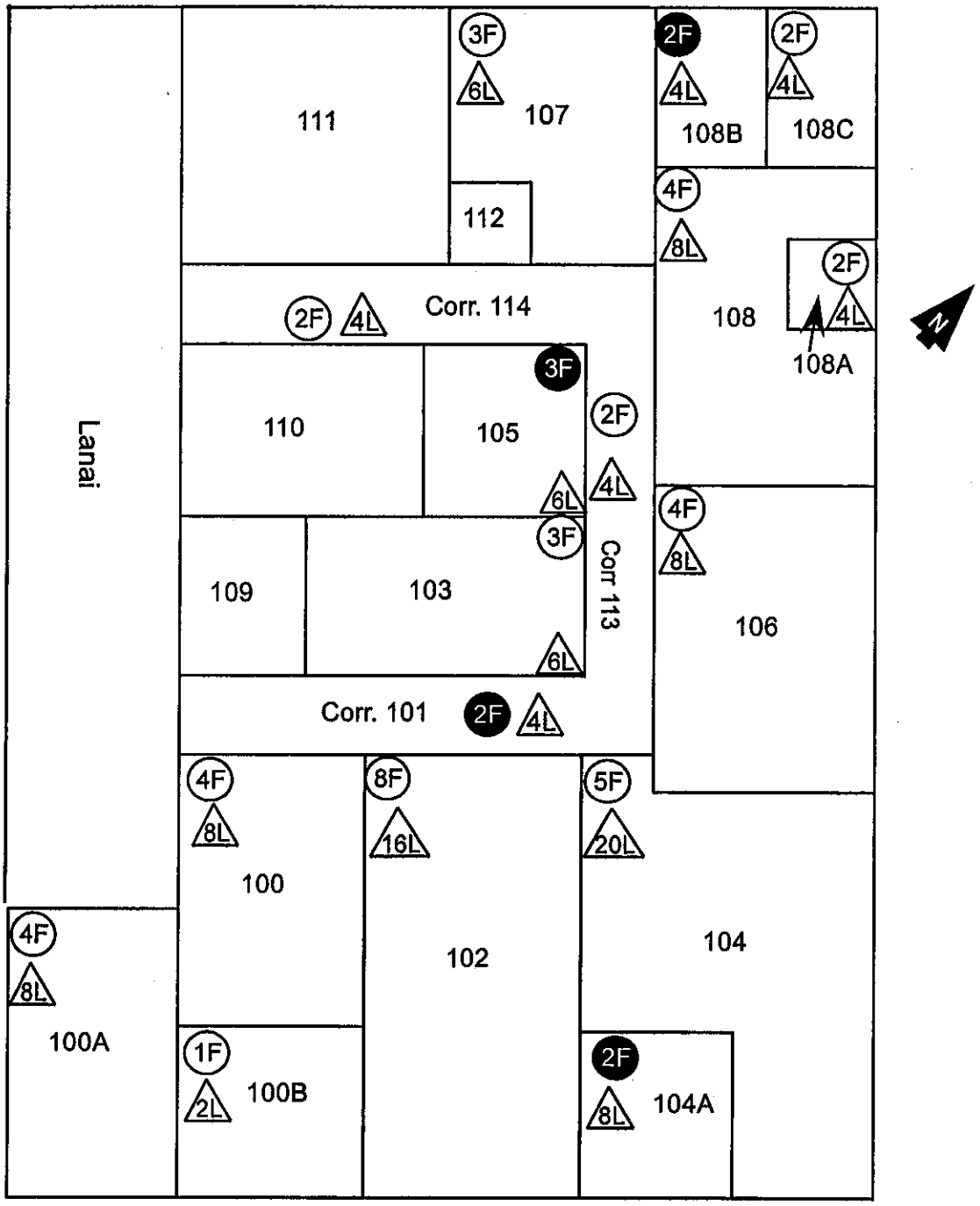
| Building # | Room # | Sketch ID | Florescent Light Fixtures Inventoried | Florescent Light Fixtures Inspected | Inspected for PCB-Containing Light Ballast | Type of Lamp | # of Light Bulbs |
|---|---|---|---|---|---|---|---|
| 358 | 374 | 358-3-D | 3 | | INV | | 6 |
| 358 | 375 | 358-3-D | 2 | | INV | | 4 |
| **358** | **376** | **358-3-D** | **2** | **2** | **NO PCBs** | **Phillips Econowatt** | **4** |
| 358 | 377 | 358-3-D | 2 | | INV | | 4 |
| 358 | 378 | 358-3-D | 0 | | INV | | 0 |
| 358 | 379 | 358-3-D | 0 | | INV | | 0 |
| 358 | 380 | 358-3-D | 0 | | INV | | 0 |
| 358 | 381 | 358-3-D | 2 | | INV | | 4 |
| | | | 2444 | 347 | | | 5561 |

# APPENDIX C

## Sketches

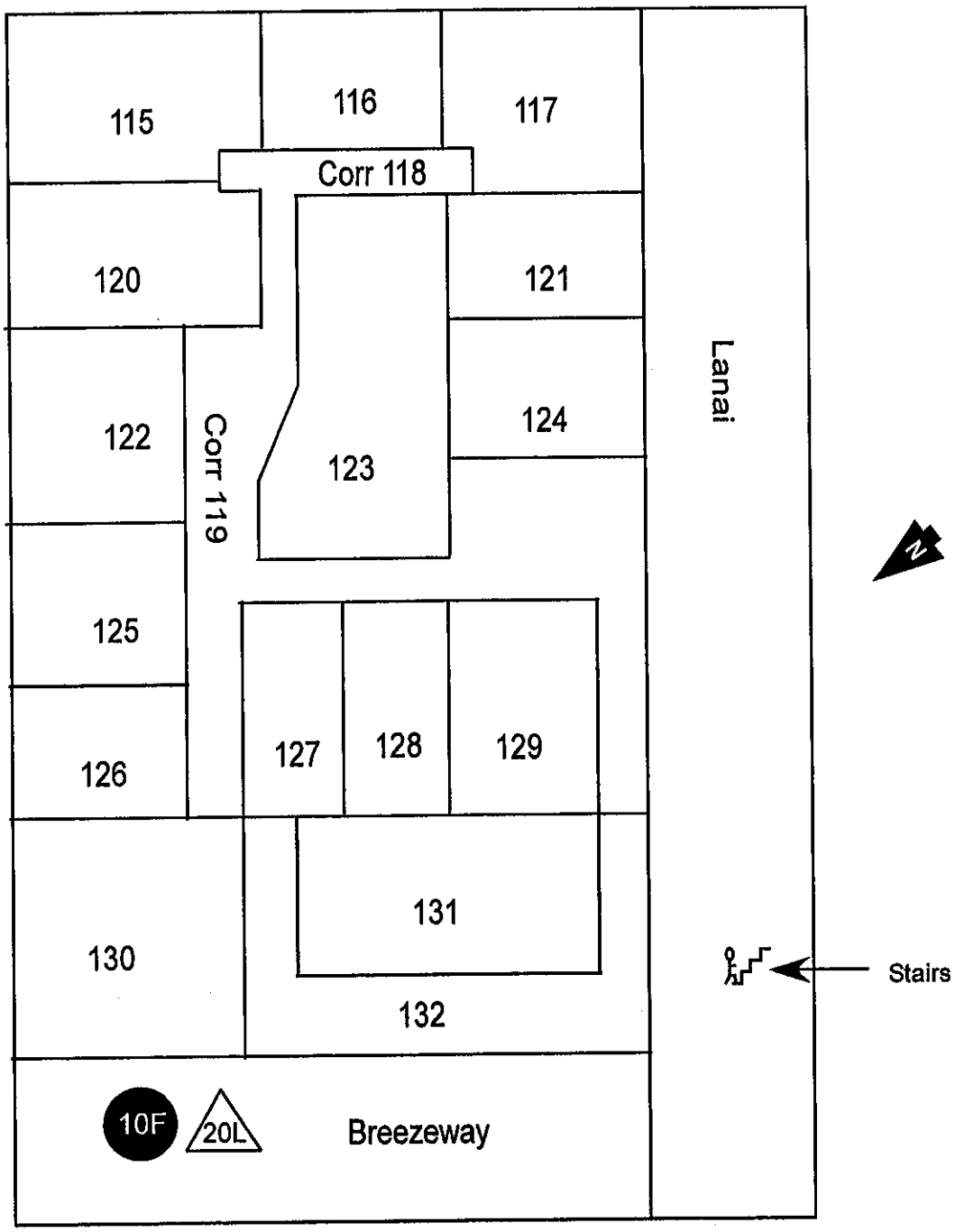
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-1-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

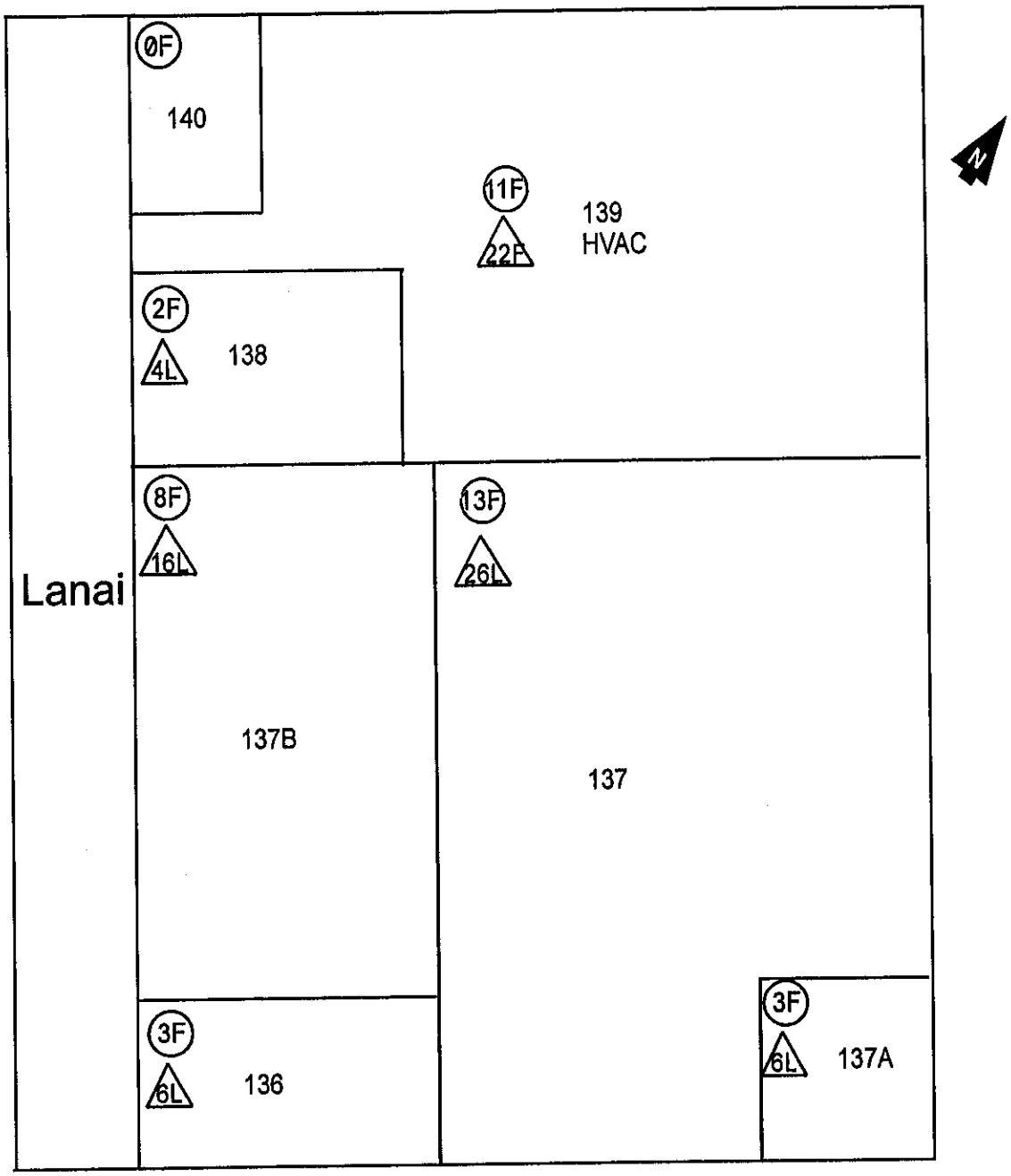
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-1-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

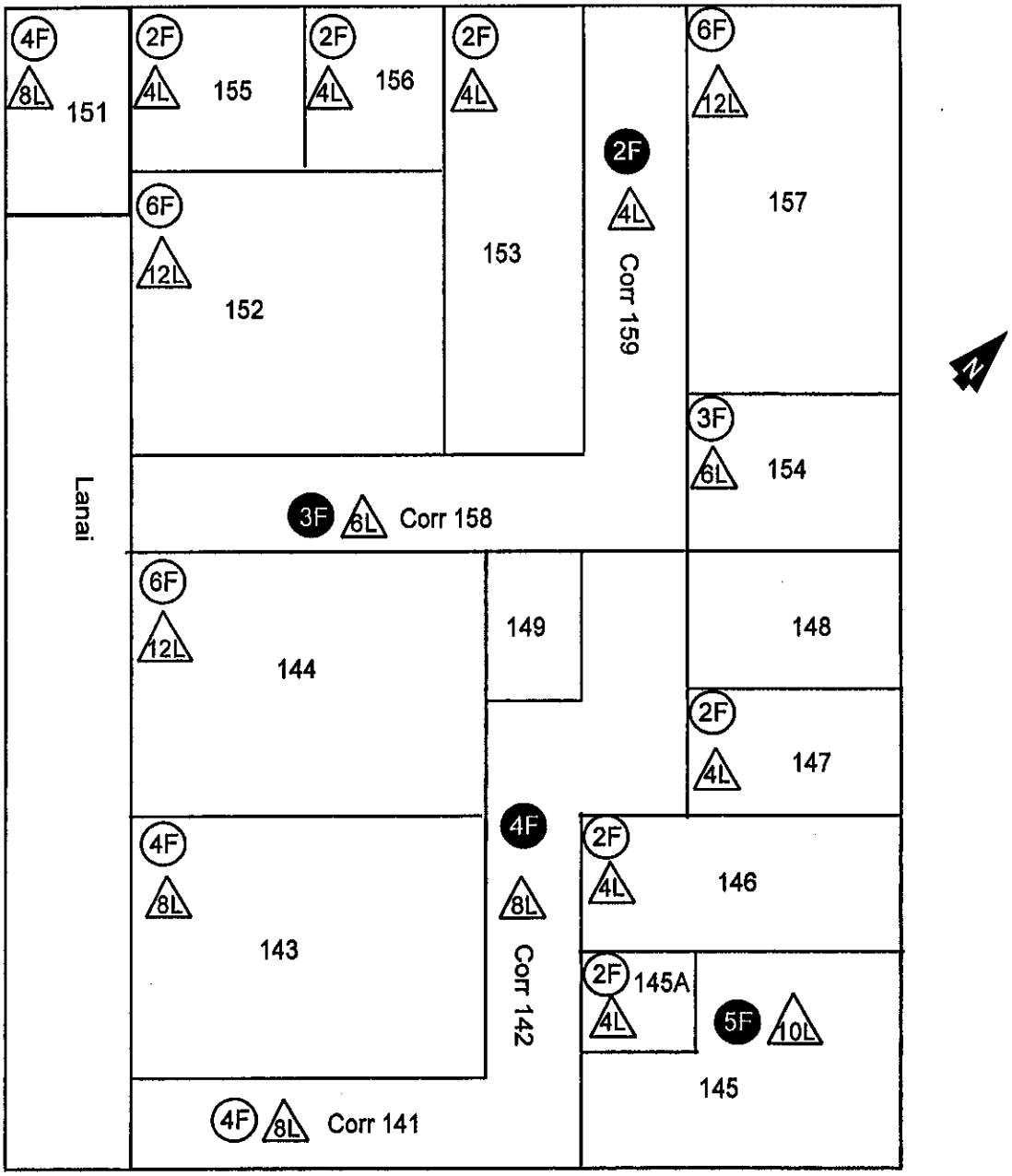
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-1-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

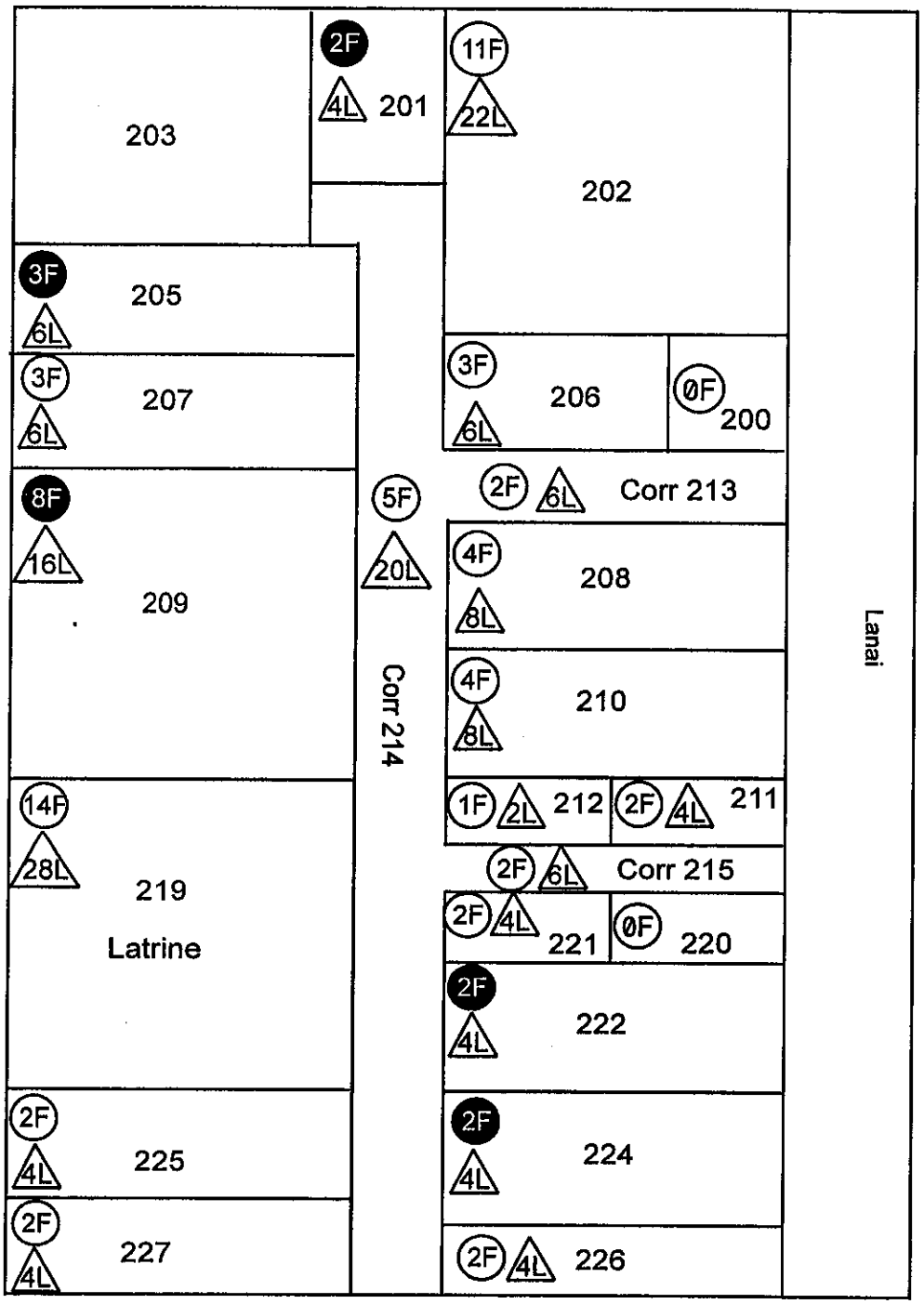
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-1-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

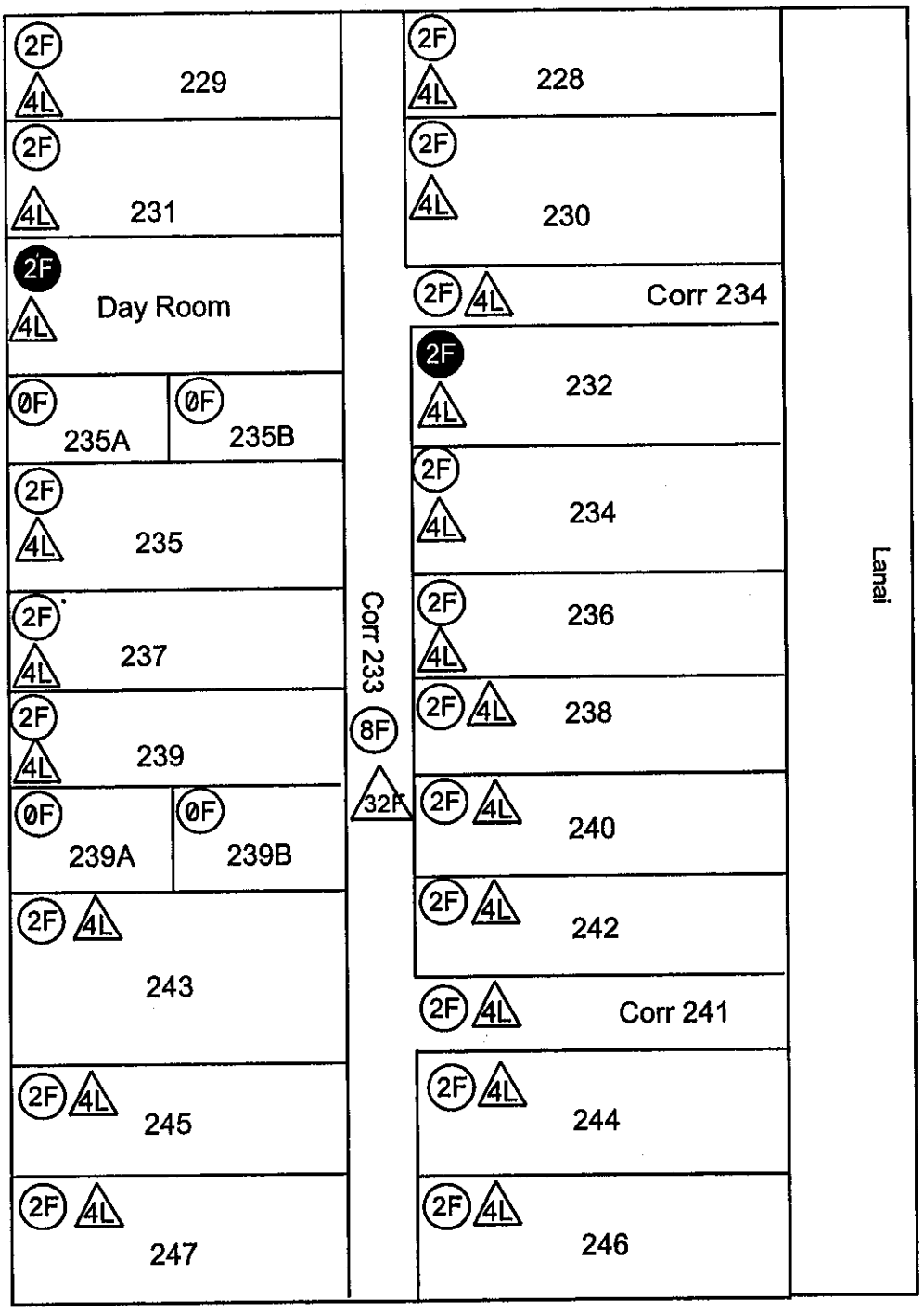
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-2-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

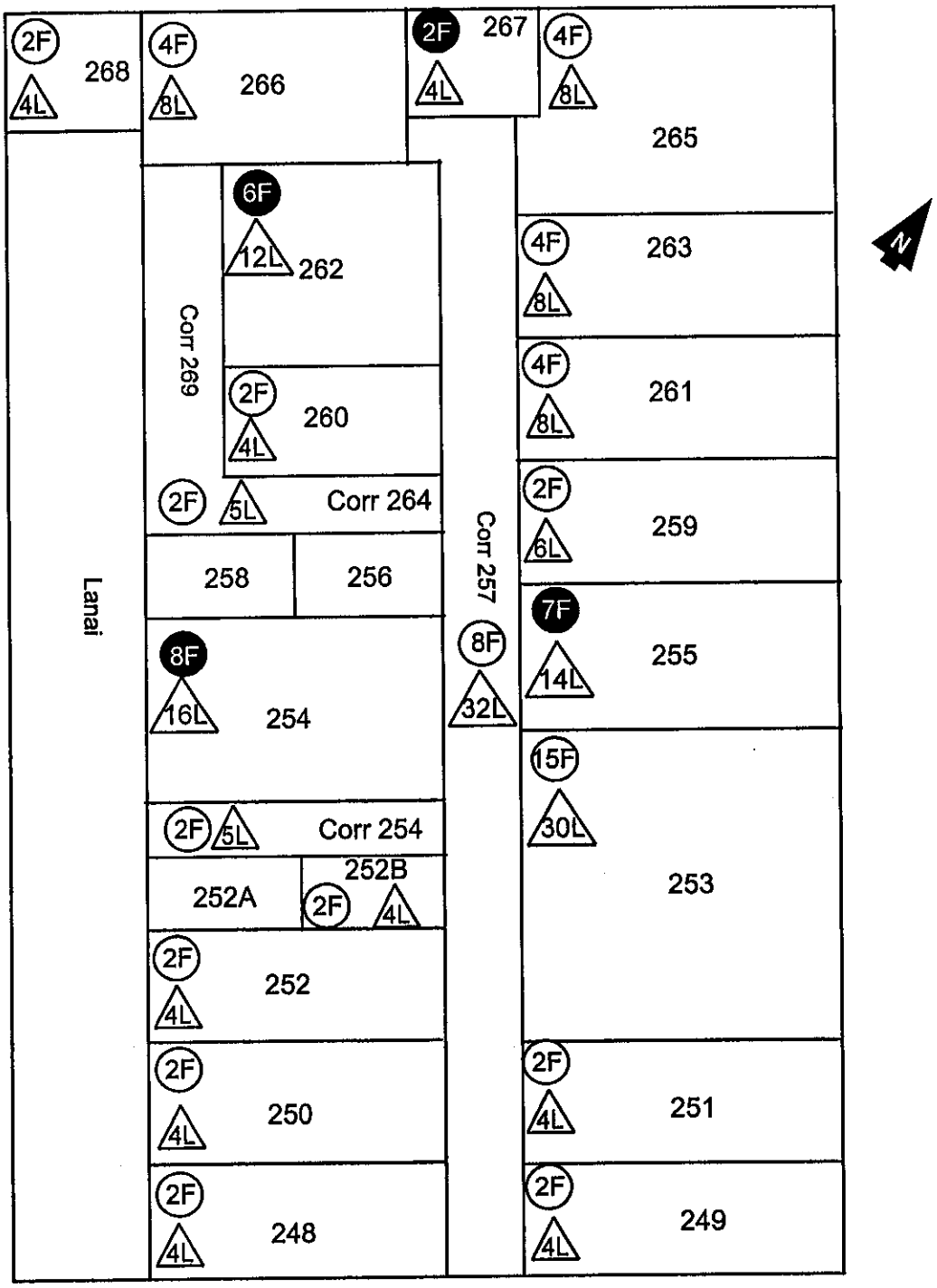
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-2-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

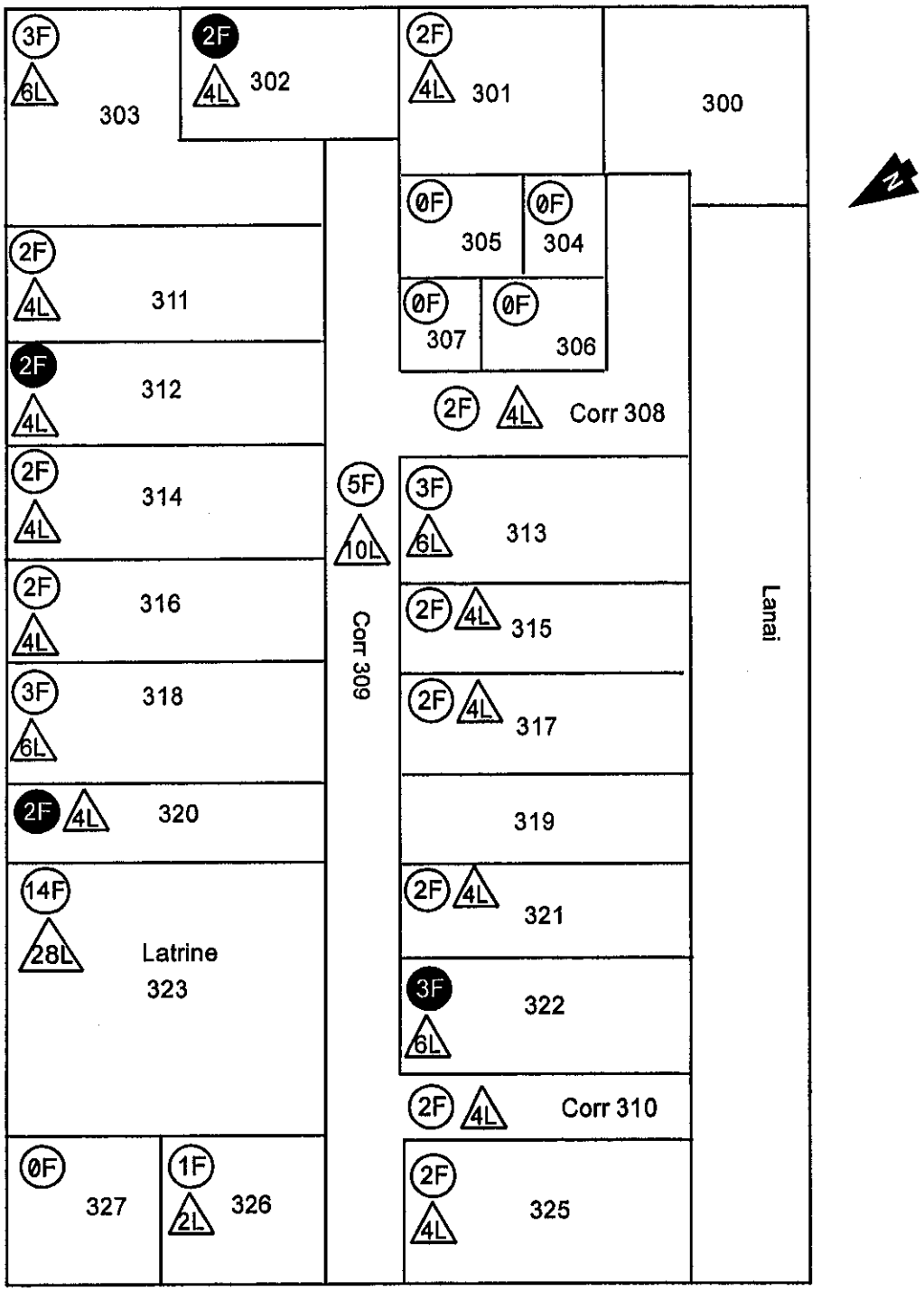
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-2-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

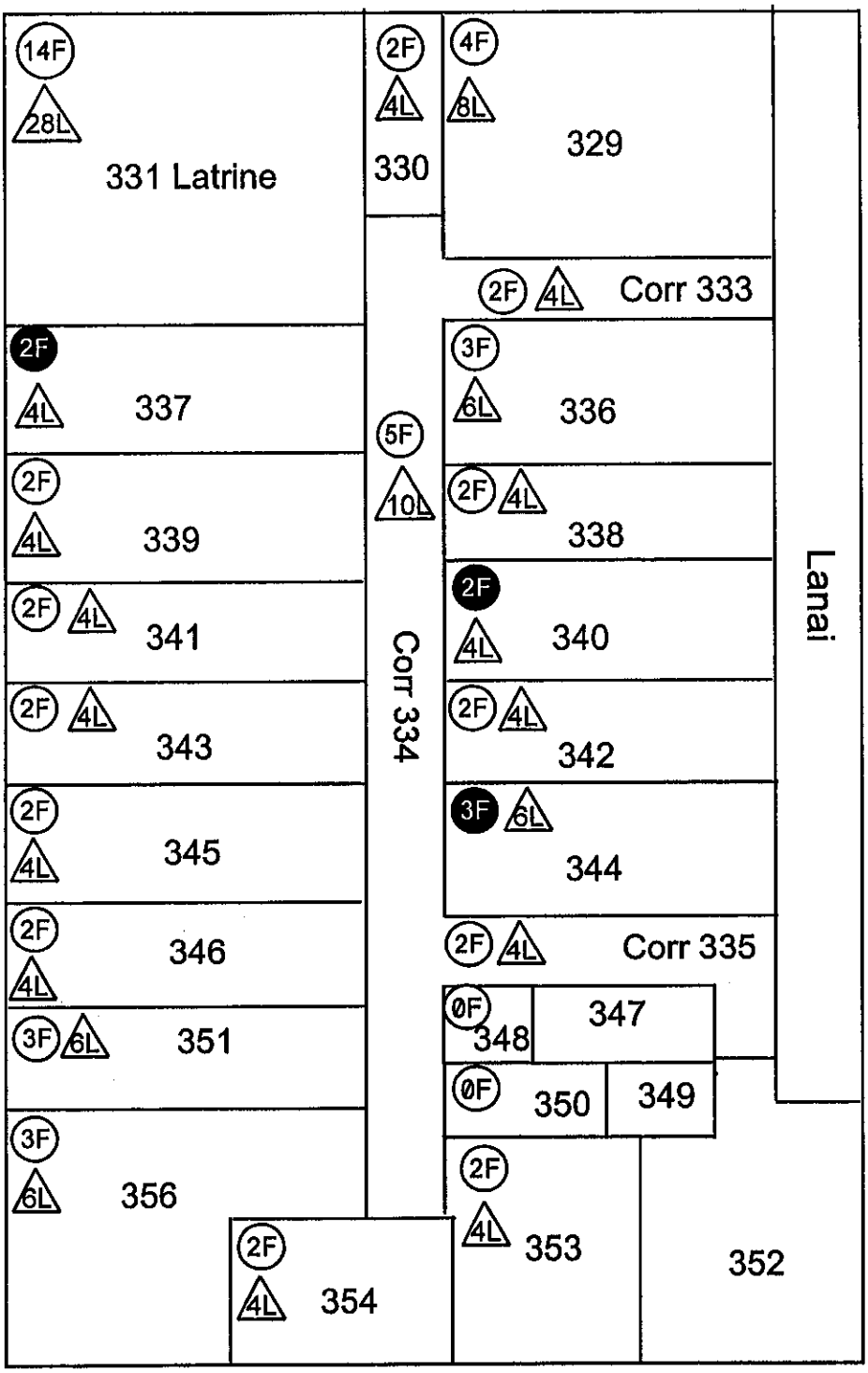
# QUAD C SCHOFIELD BARRACKS
## SKETCH 355-3-A




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

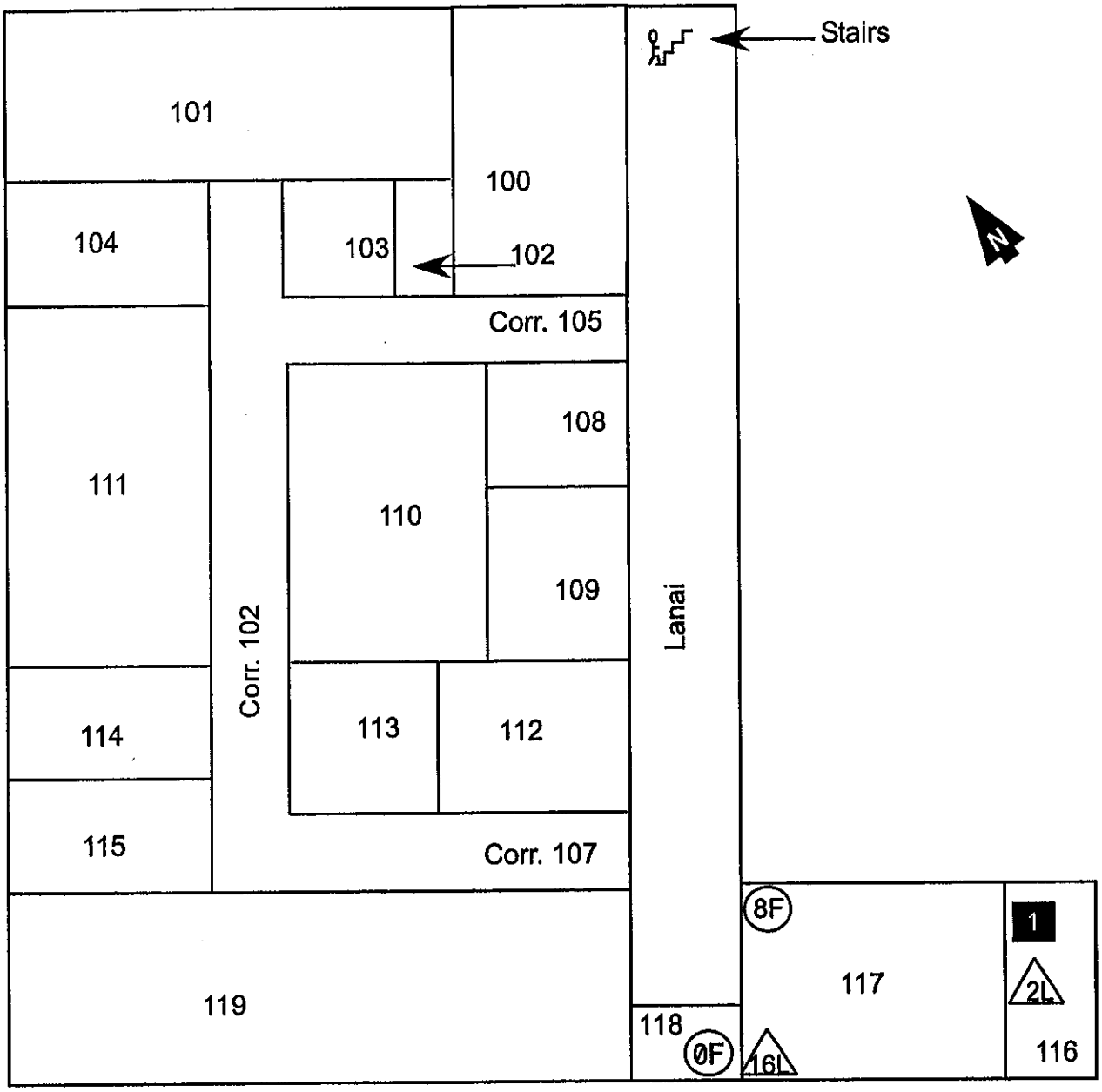
# QUAD C SCHOFIELD BARRACKS
# SKETCH 355-3-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

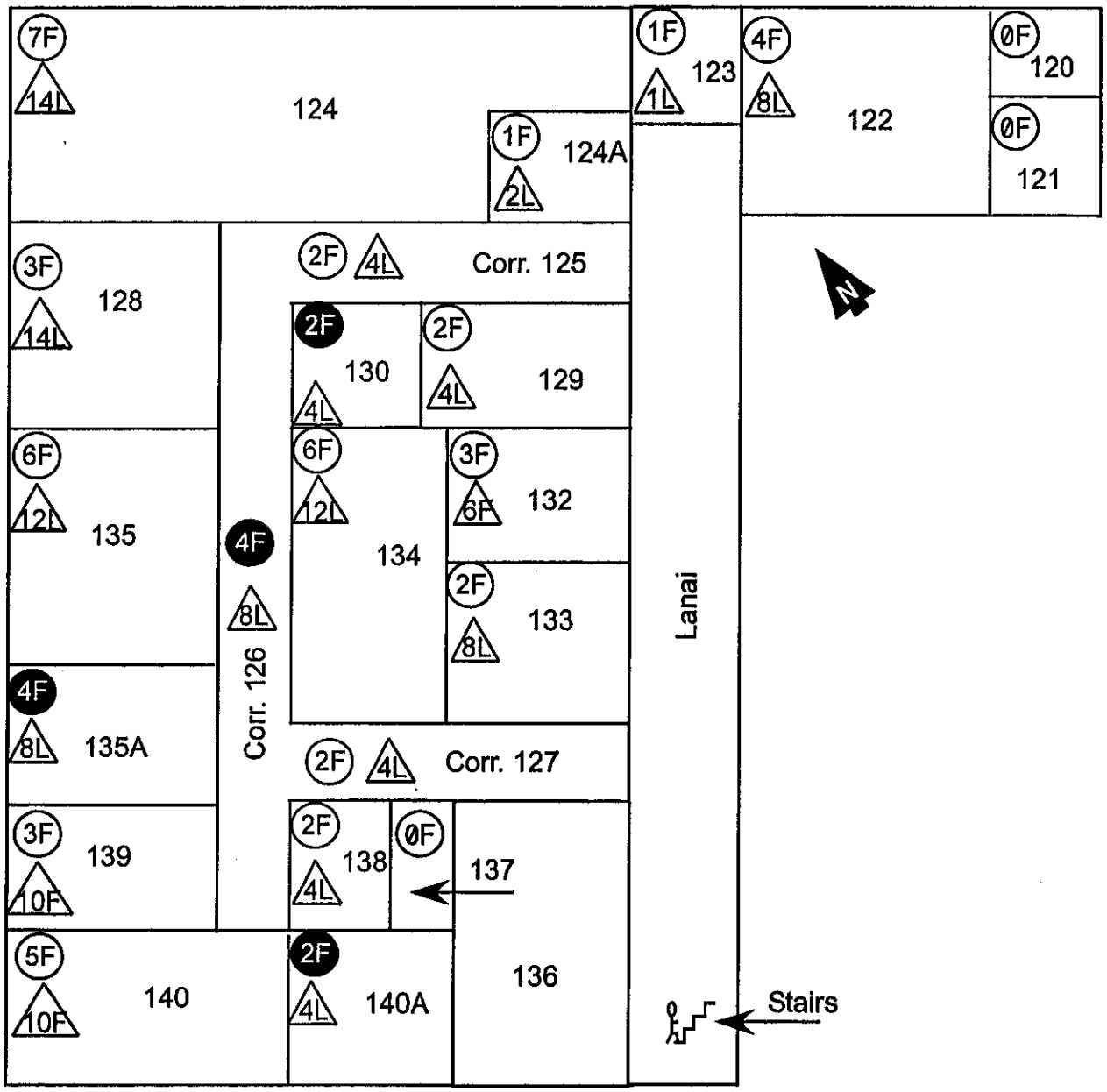
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-1-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

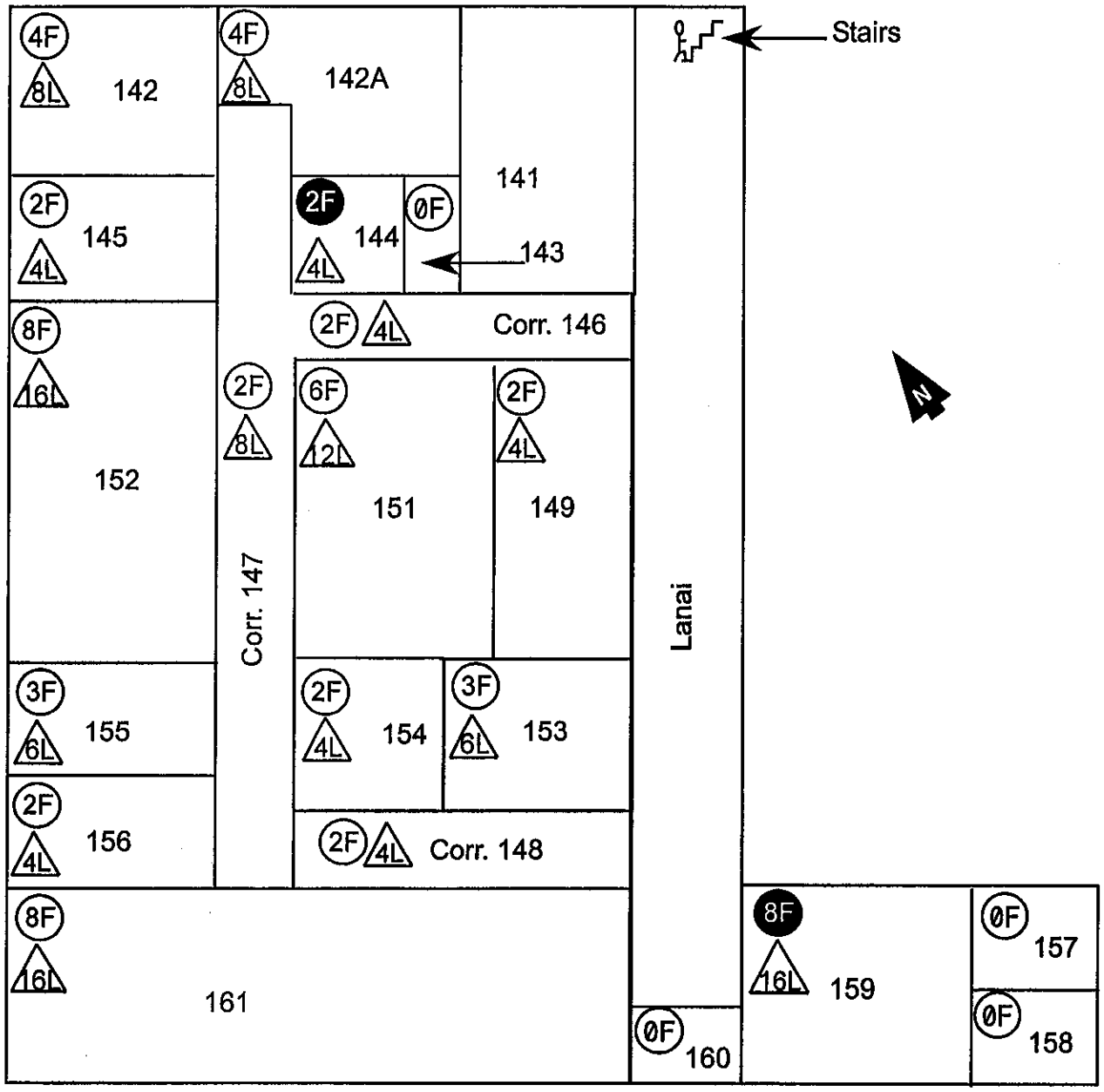
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-1-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

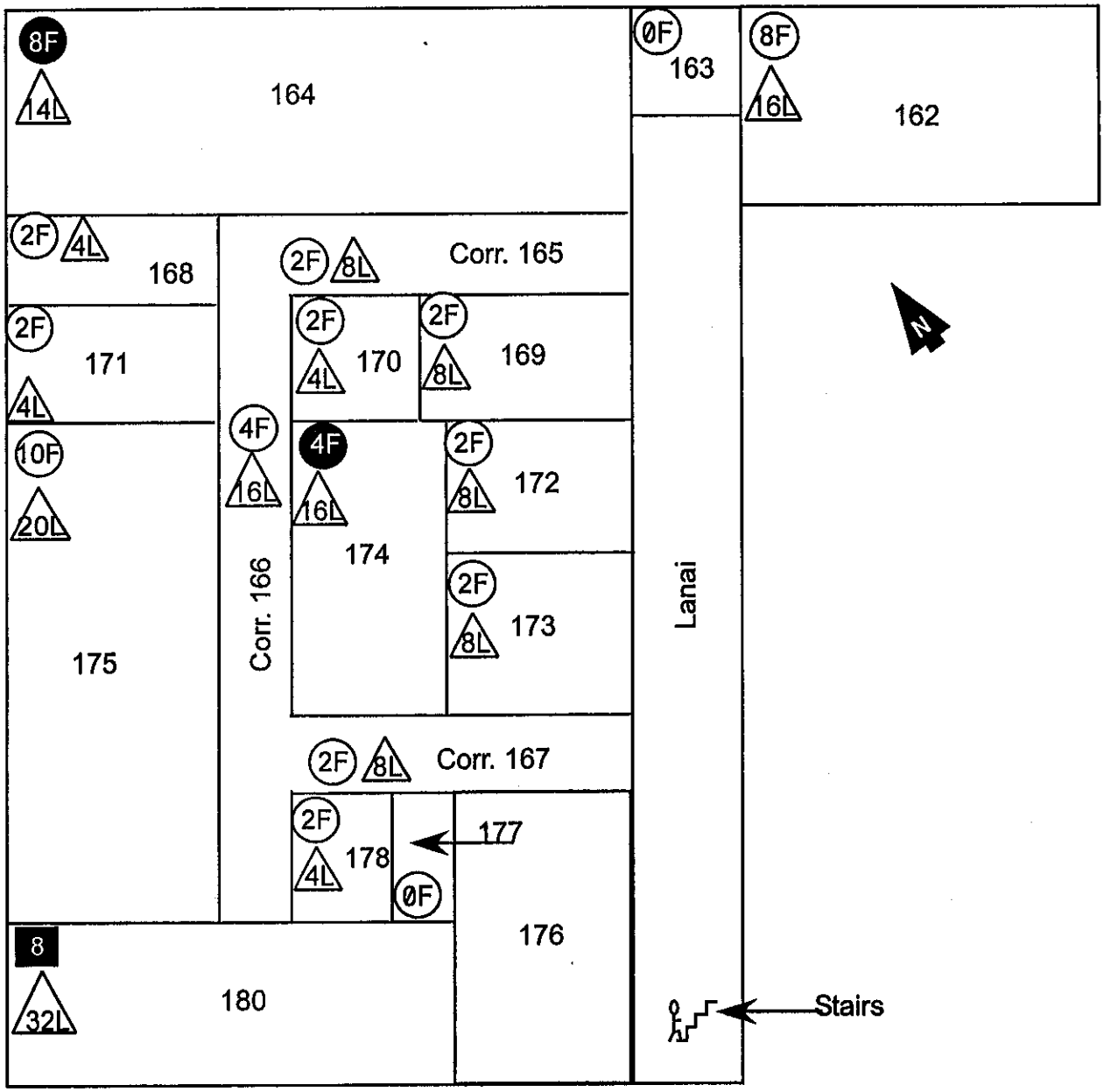
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-1-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

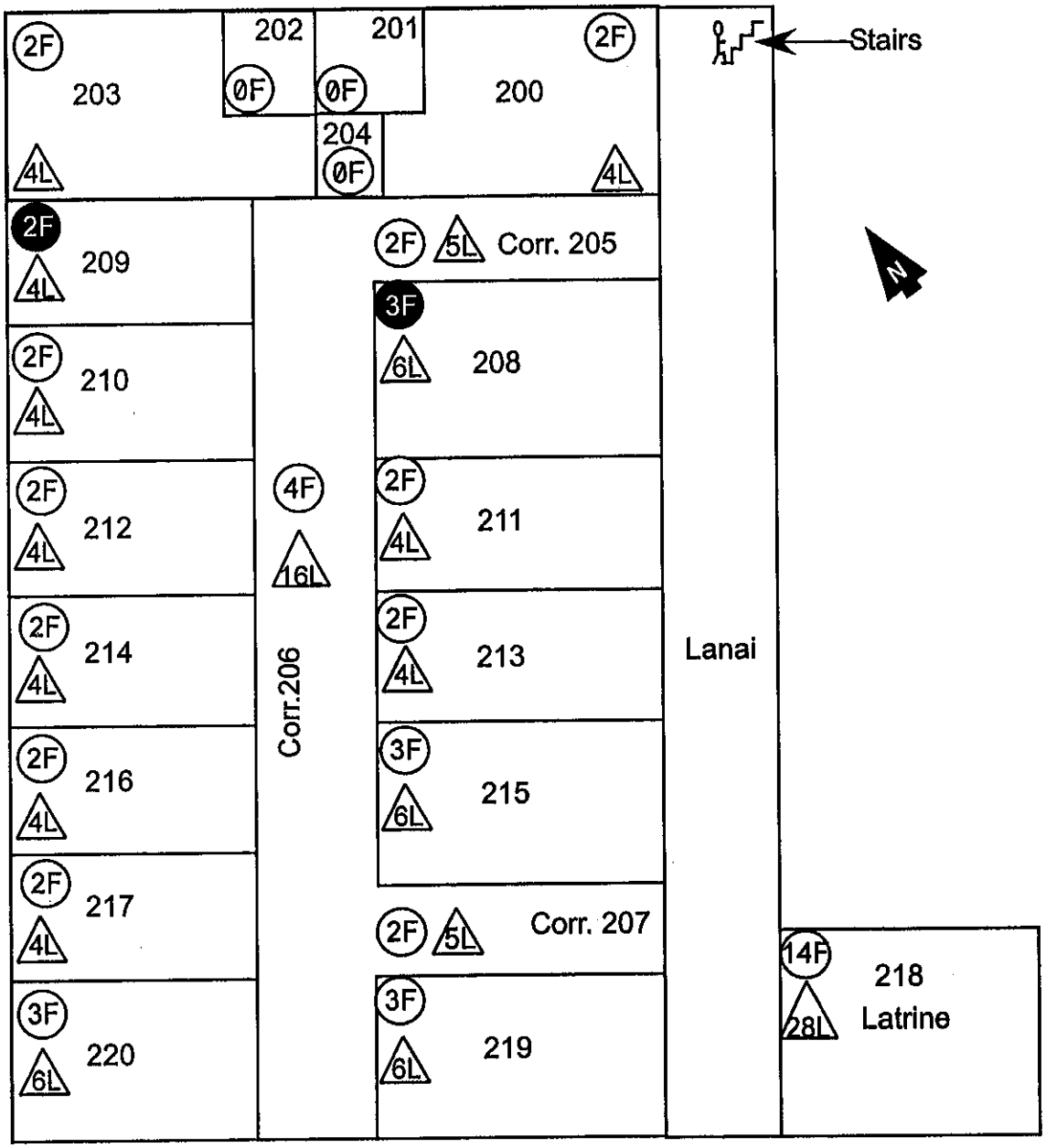
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-1-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

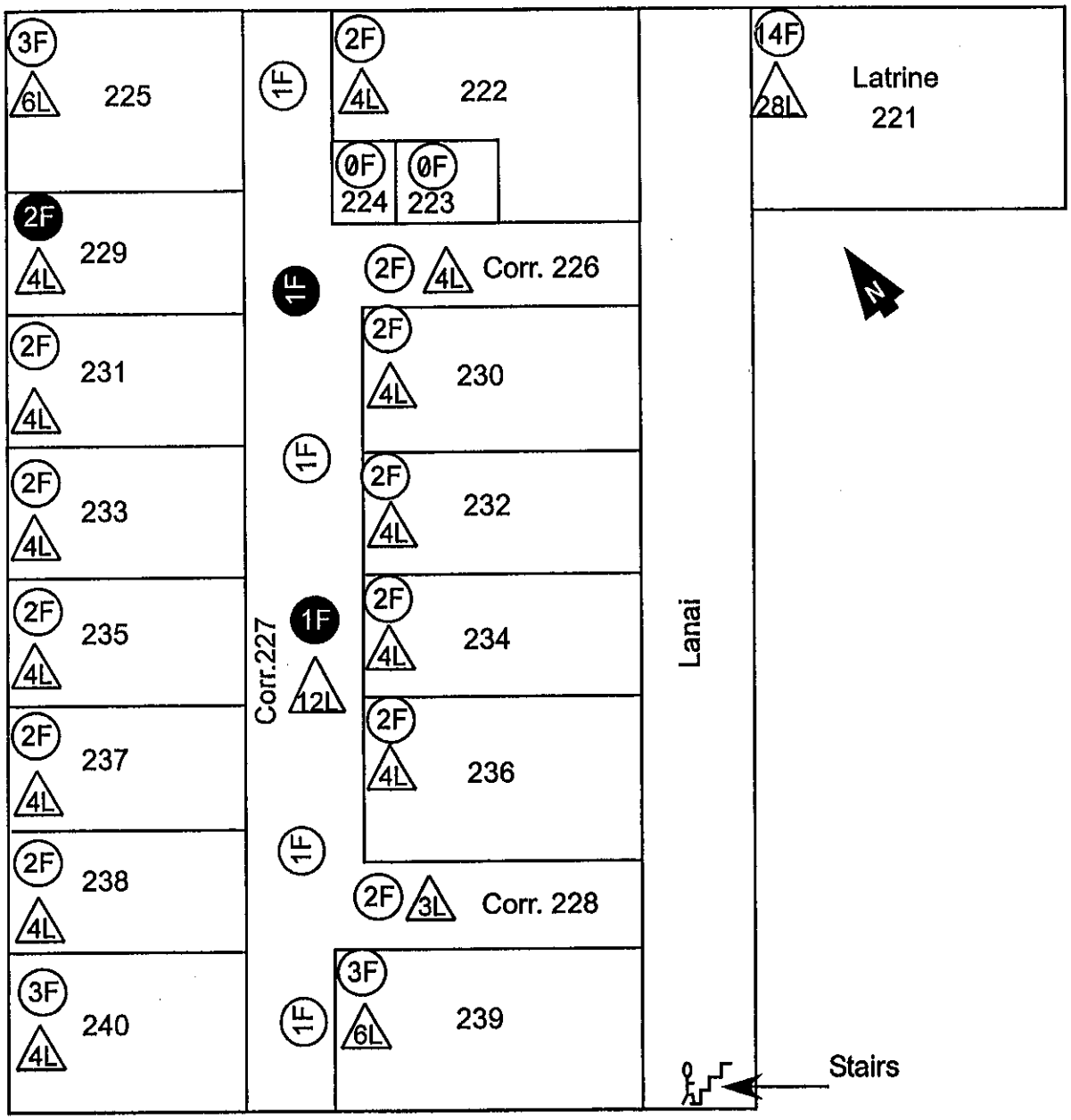
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-2-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

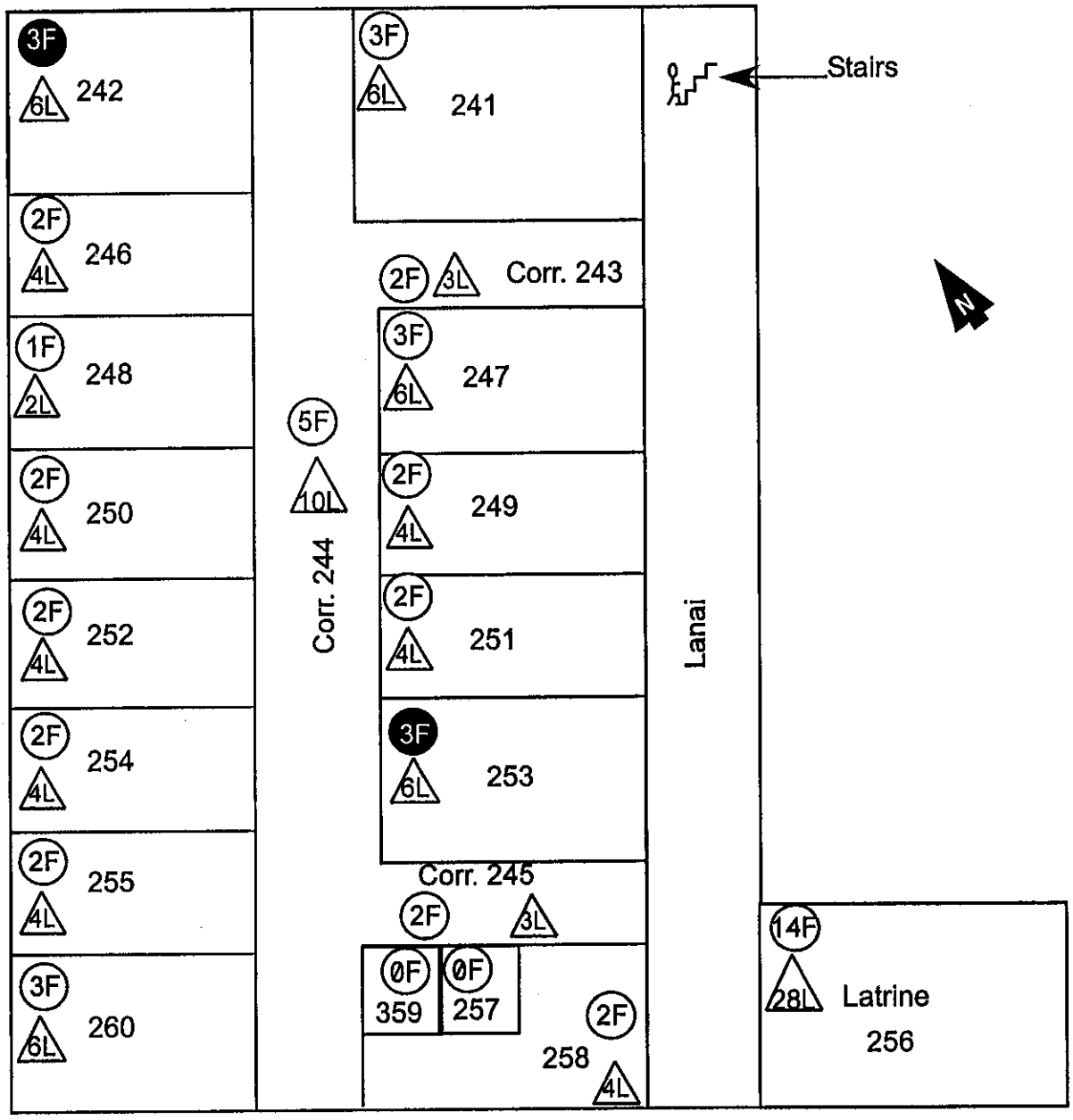
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-2-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

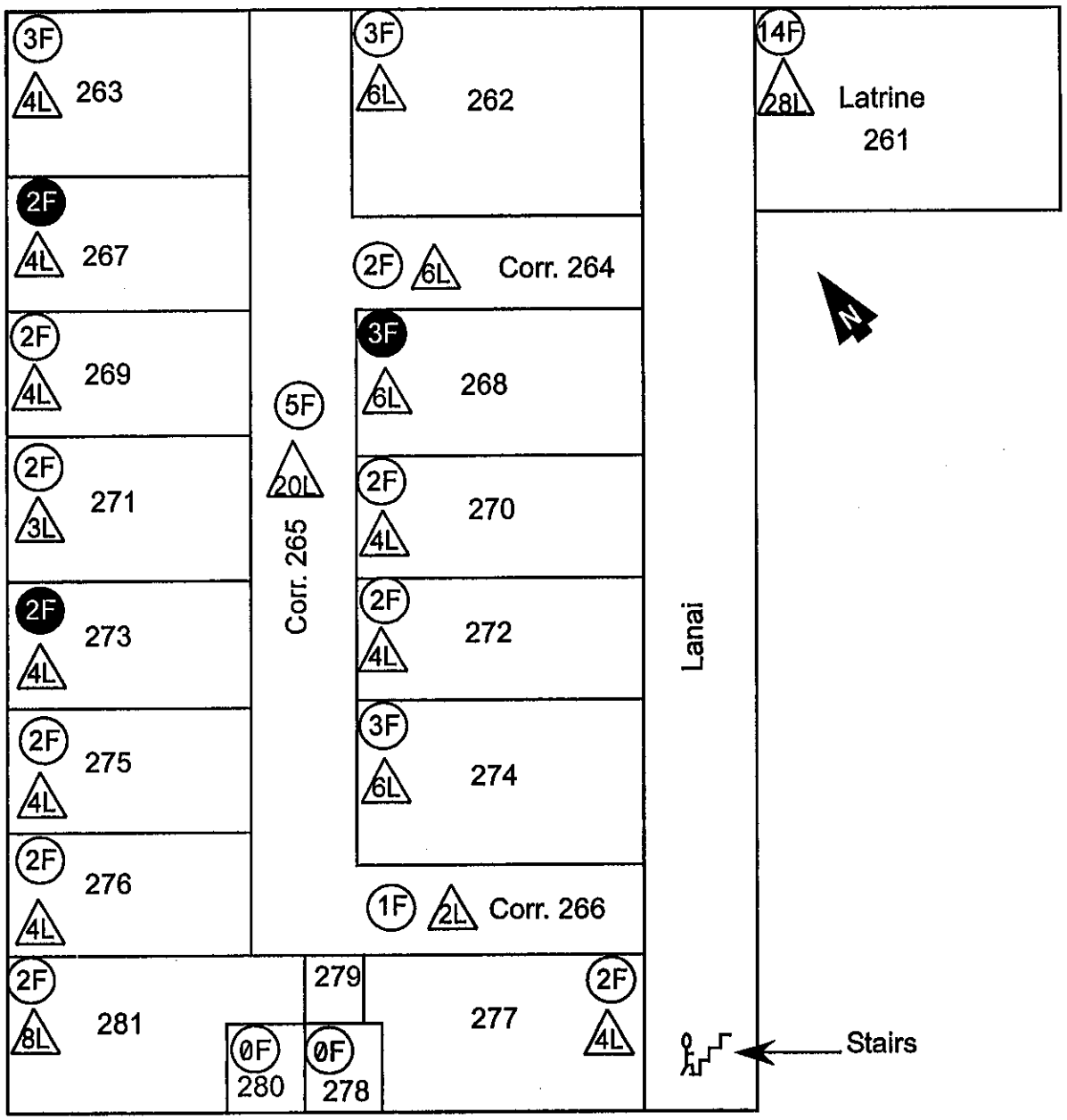
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-2-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

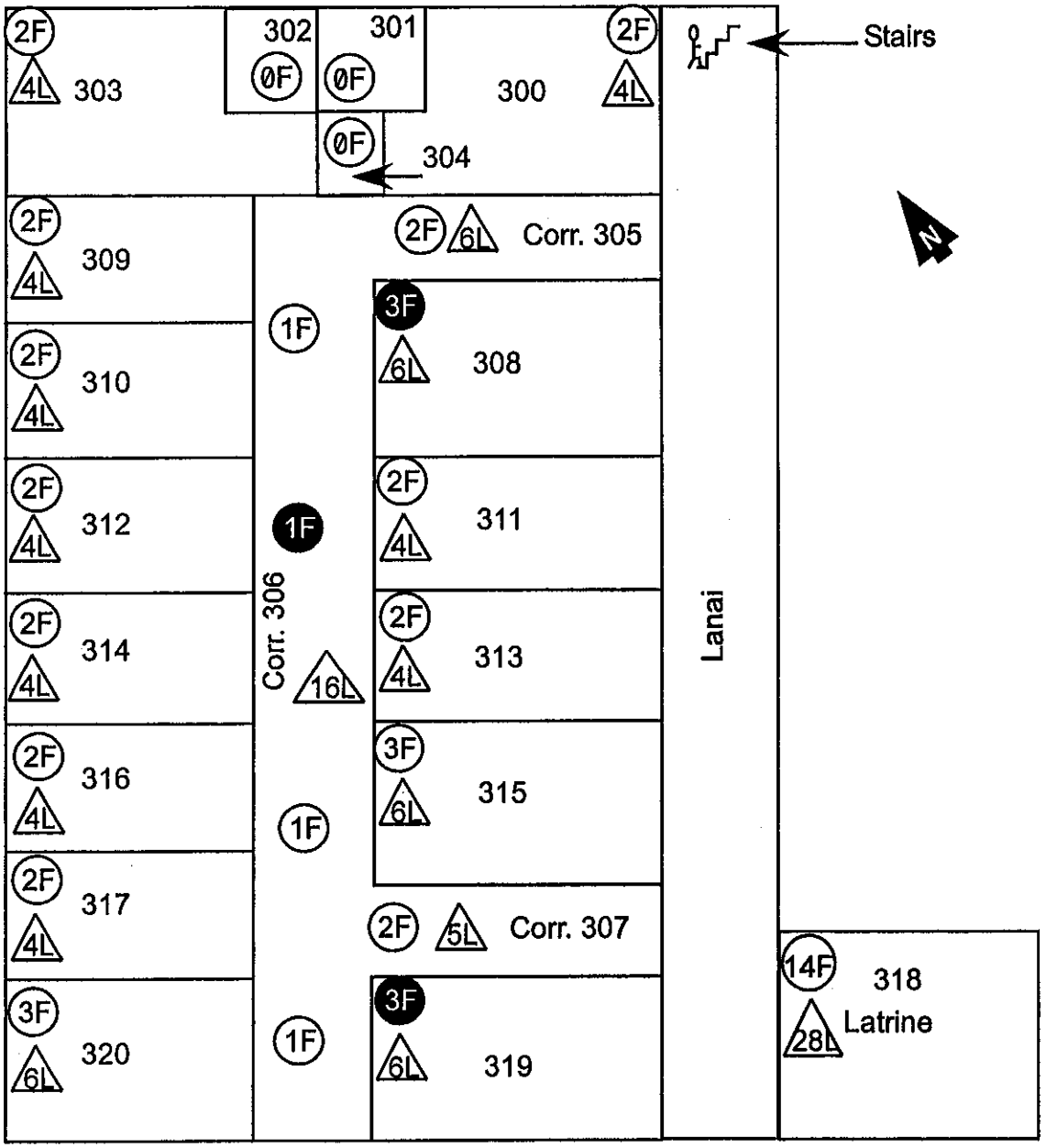
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-2-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

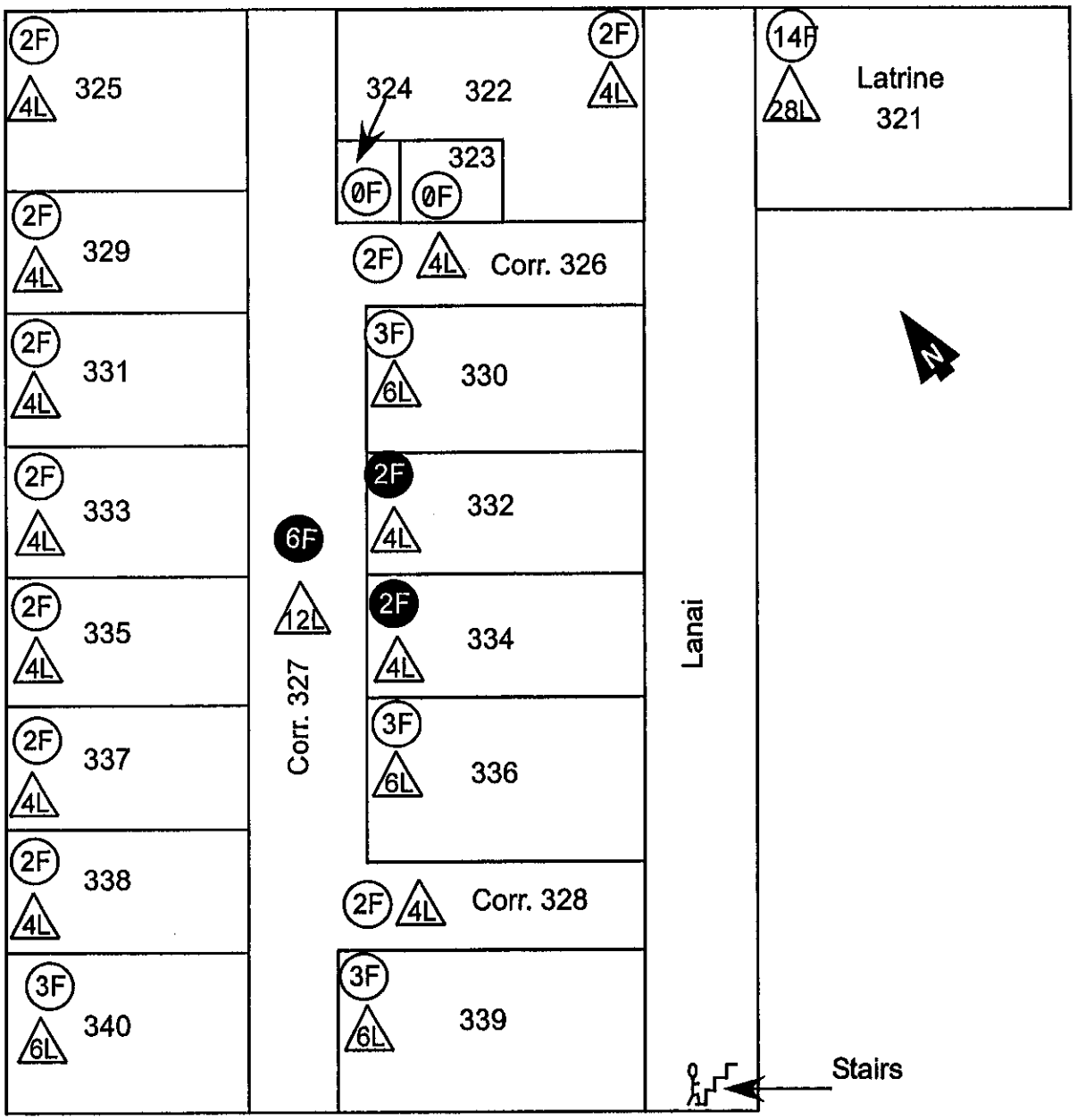
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-3-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

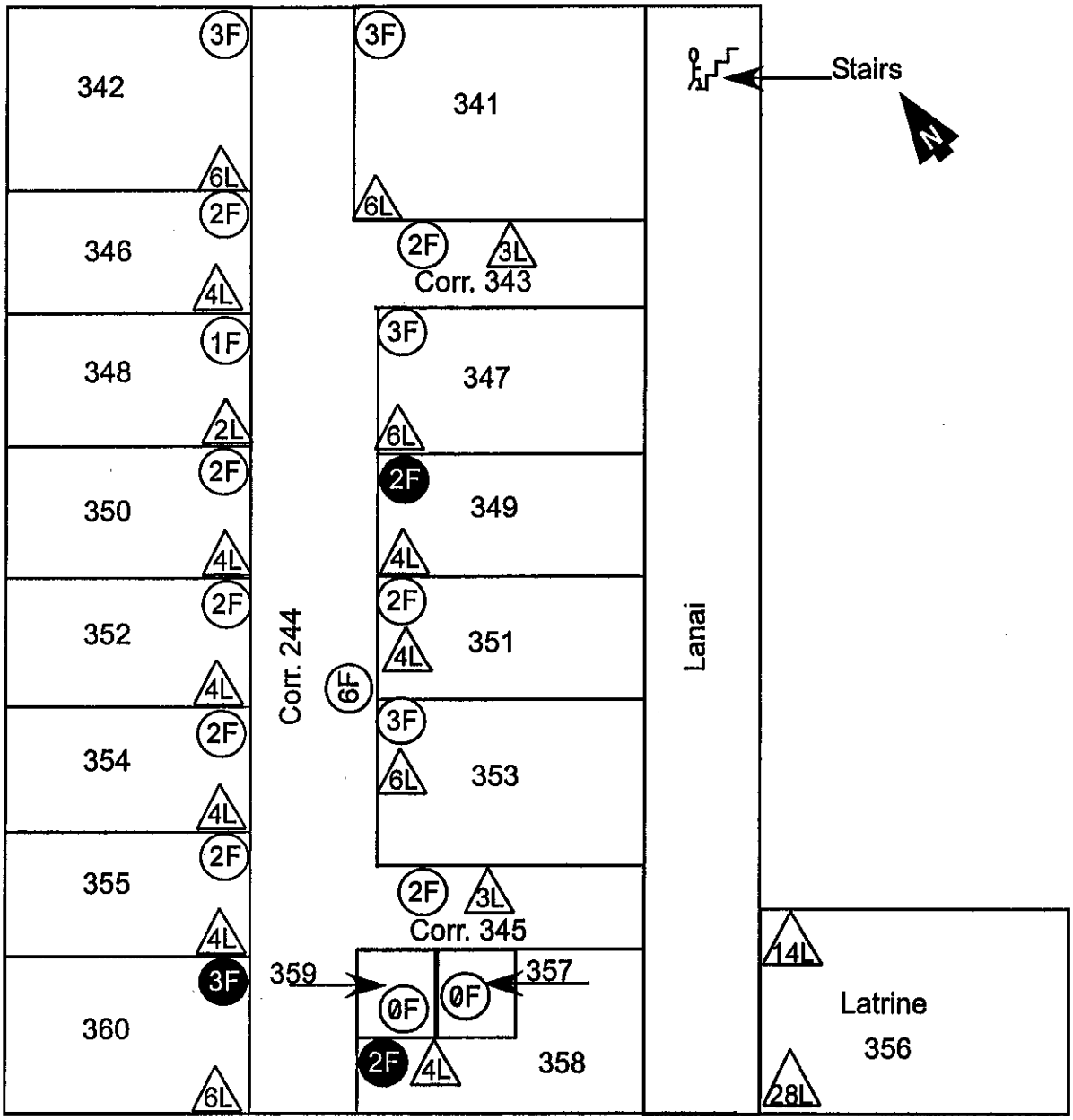
# QUAD C SCHOFIELD BARRACKS
## SKETCH 356-3-B




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

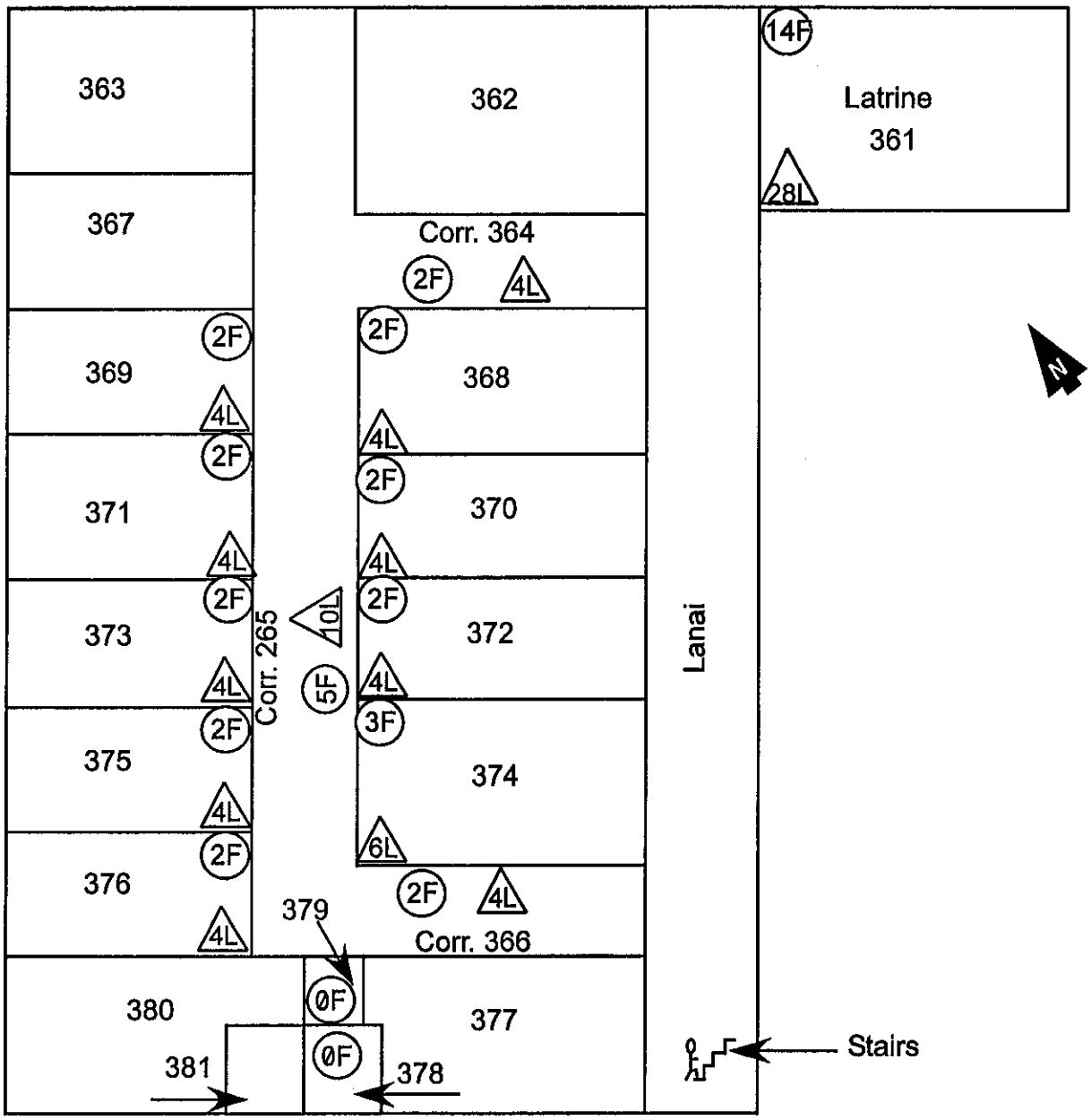
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-3-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

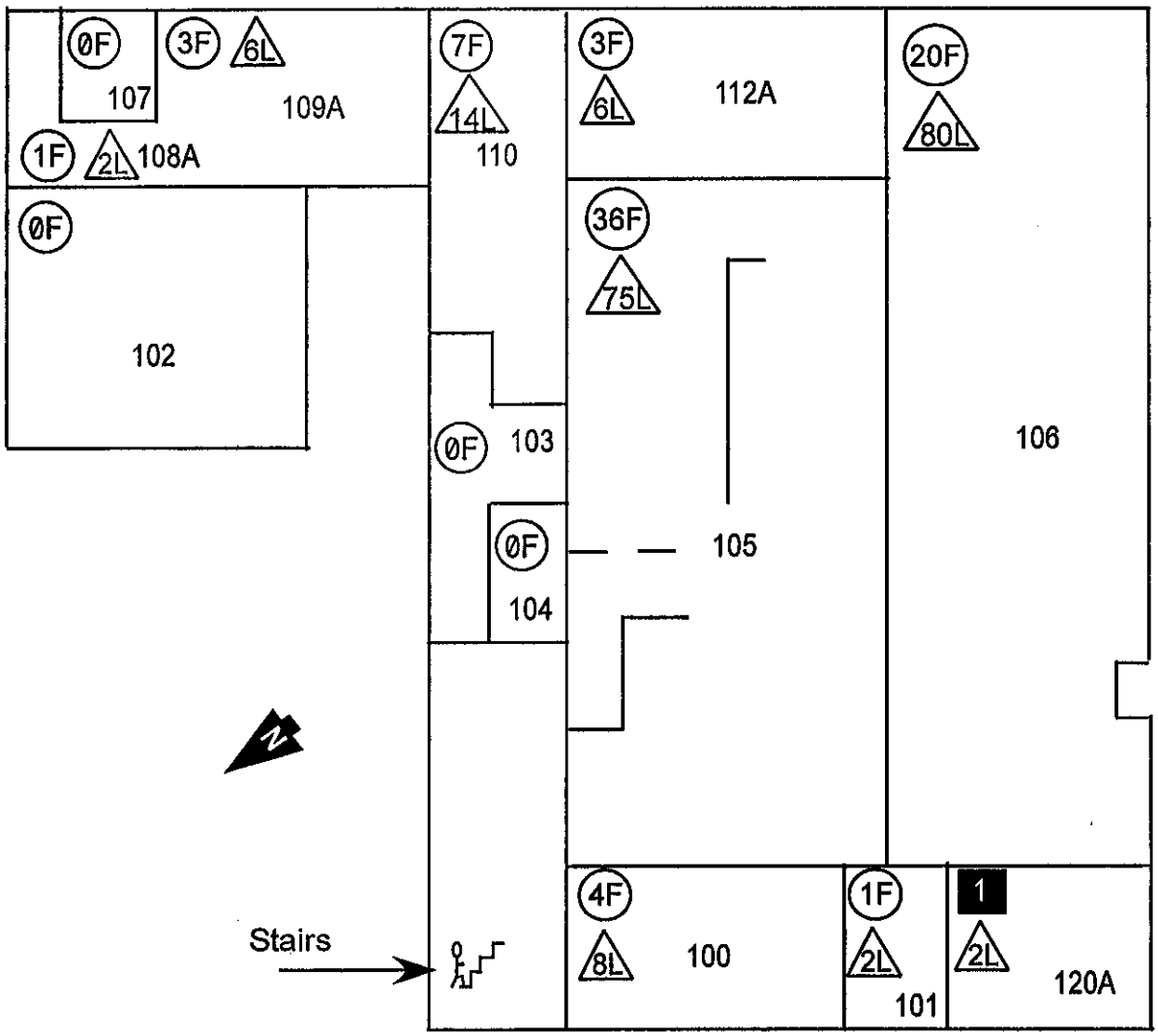
# QUAD C SCHOFIELD BARRACKS
# SKETCH 356-3-D




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

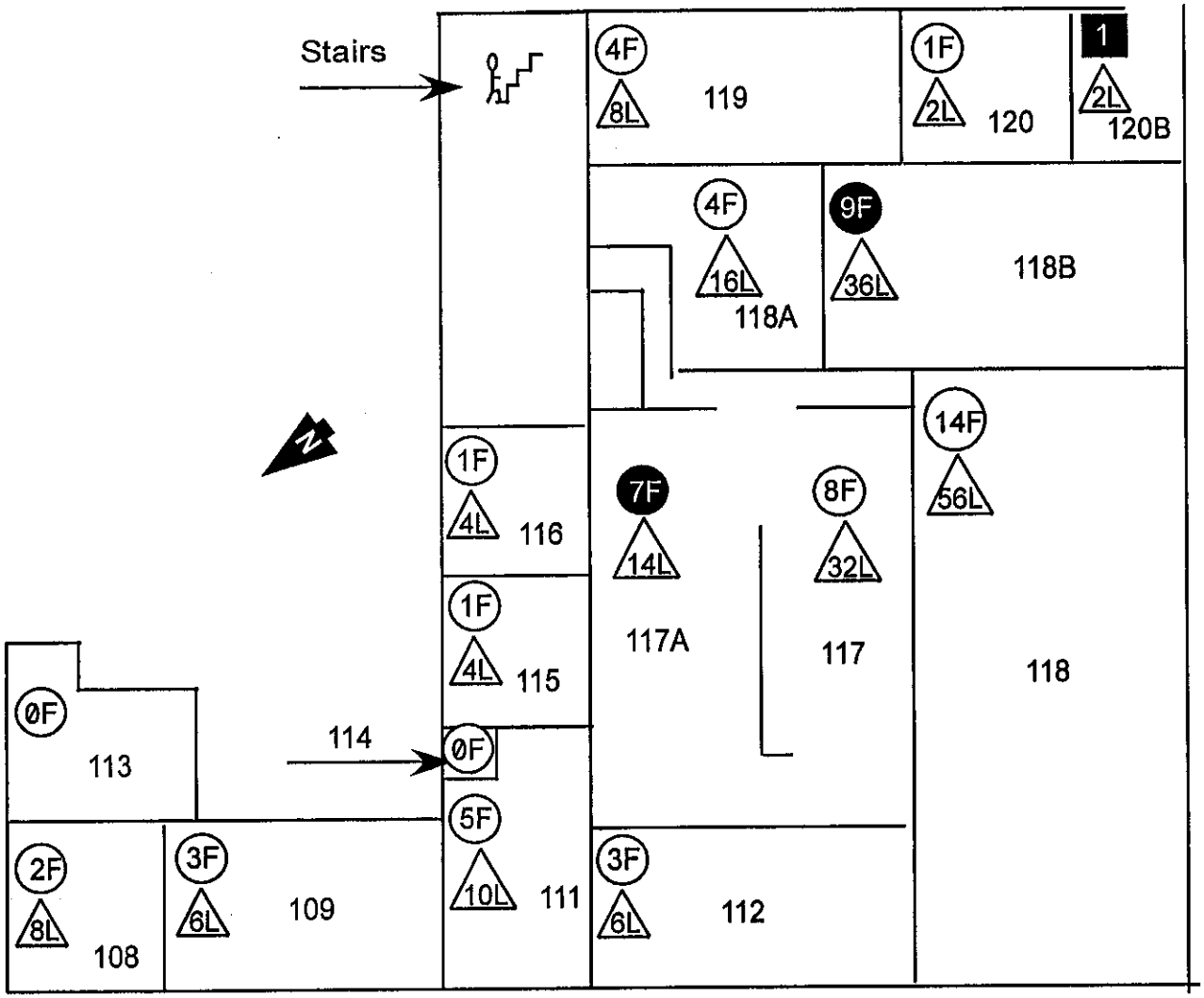
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-1-A




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

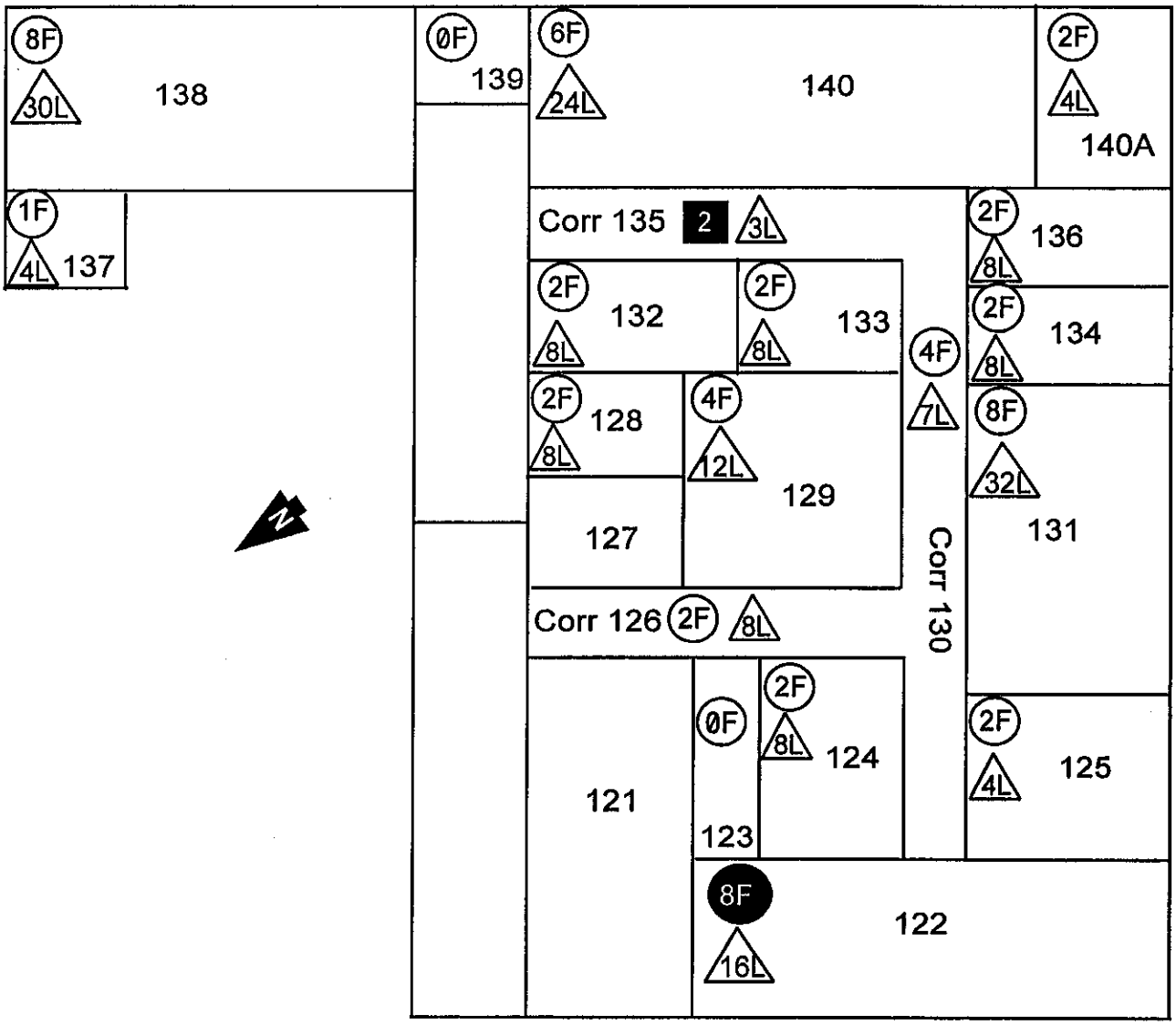
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-1-B




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

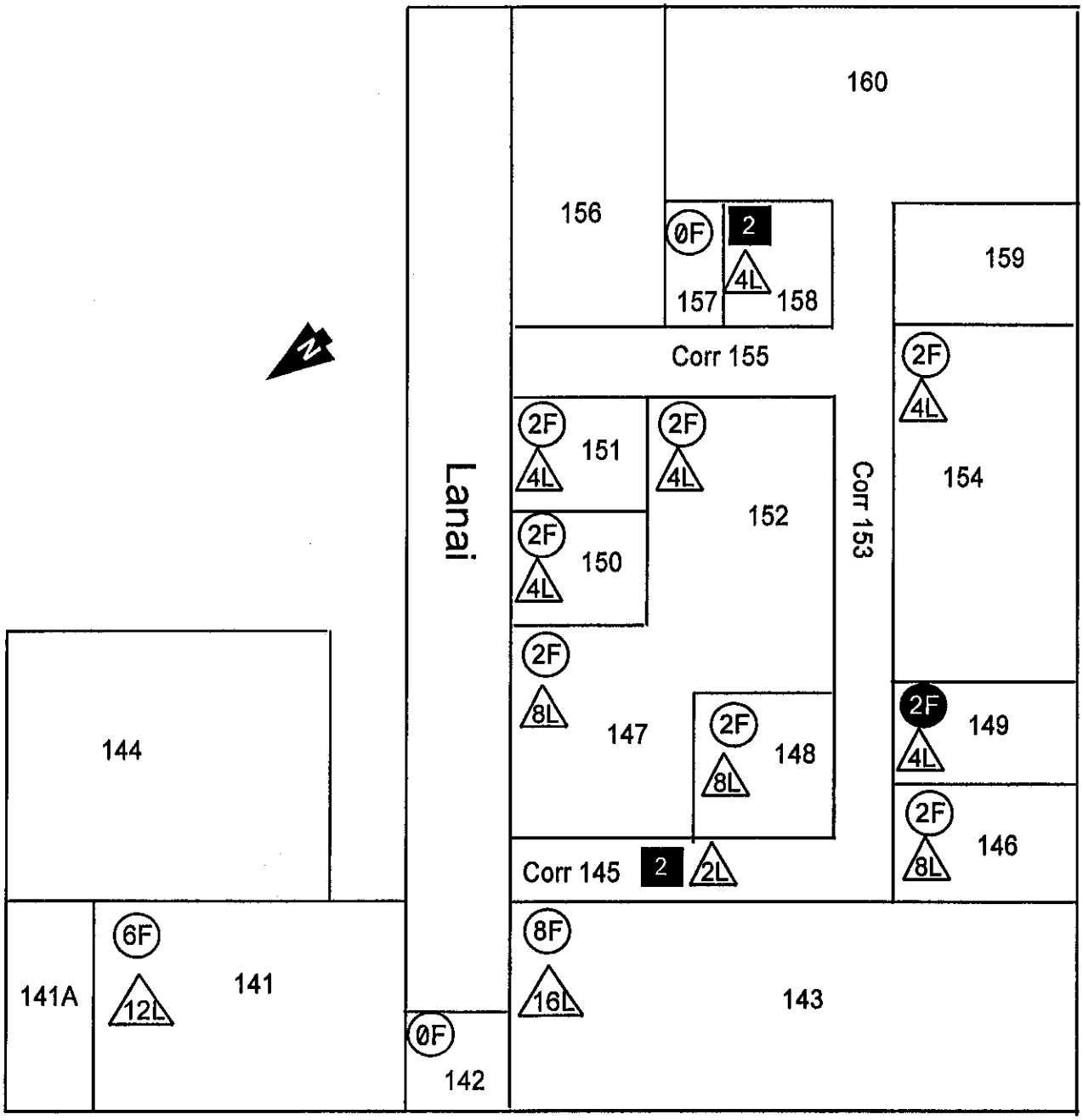
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-1-C




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

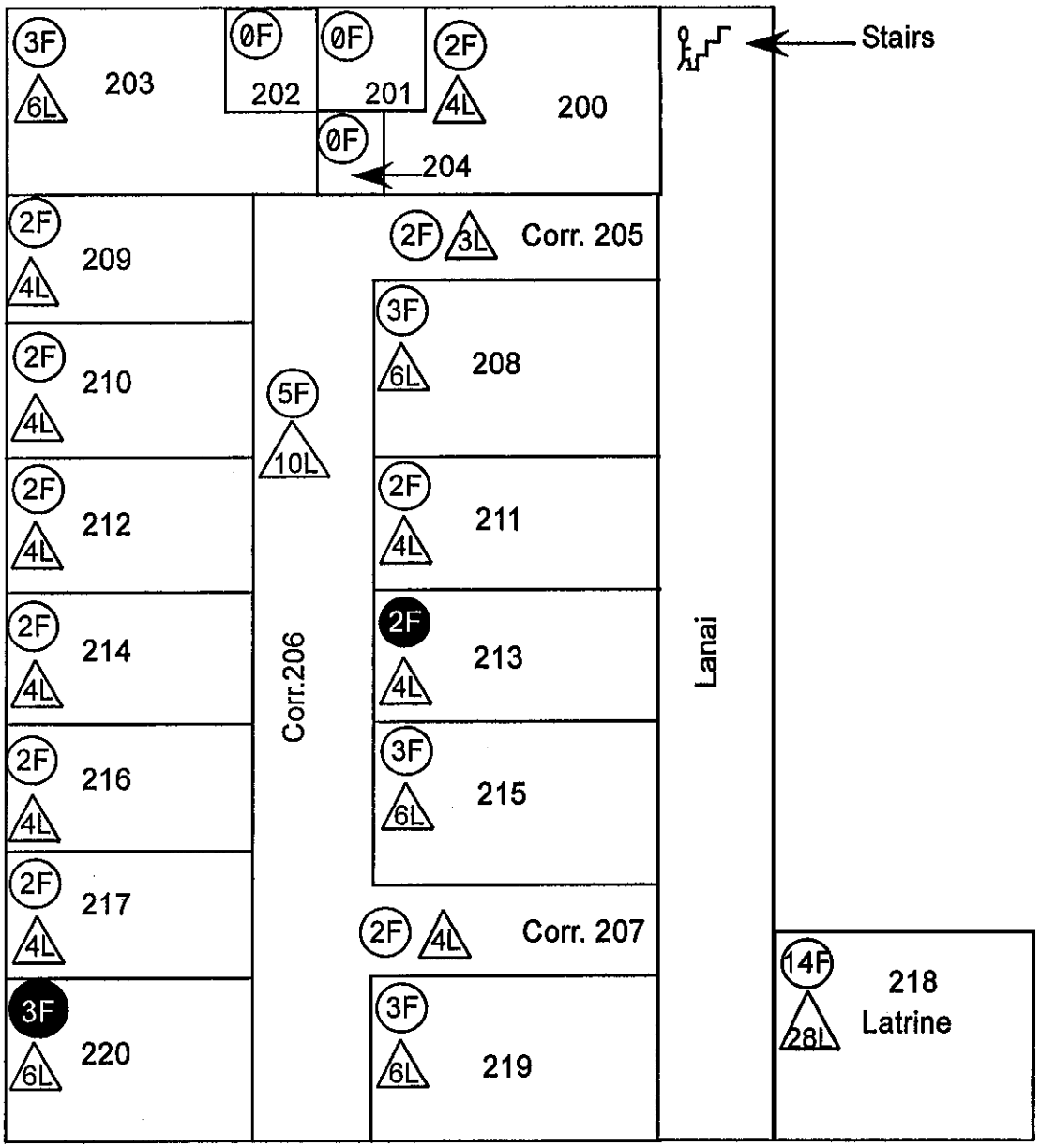
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-1-D




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

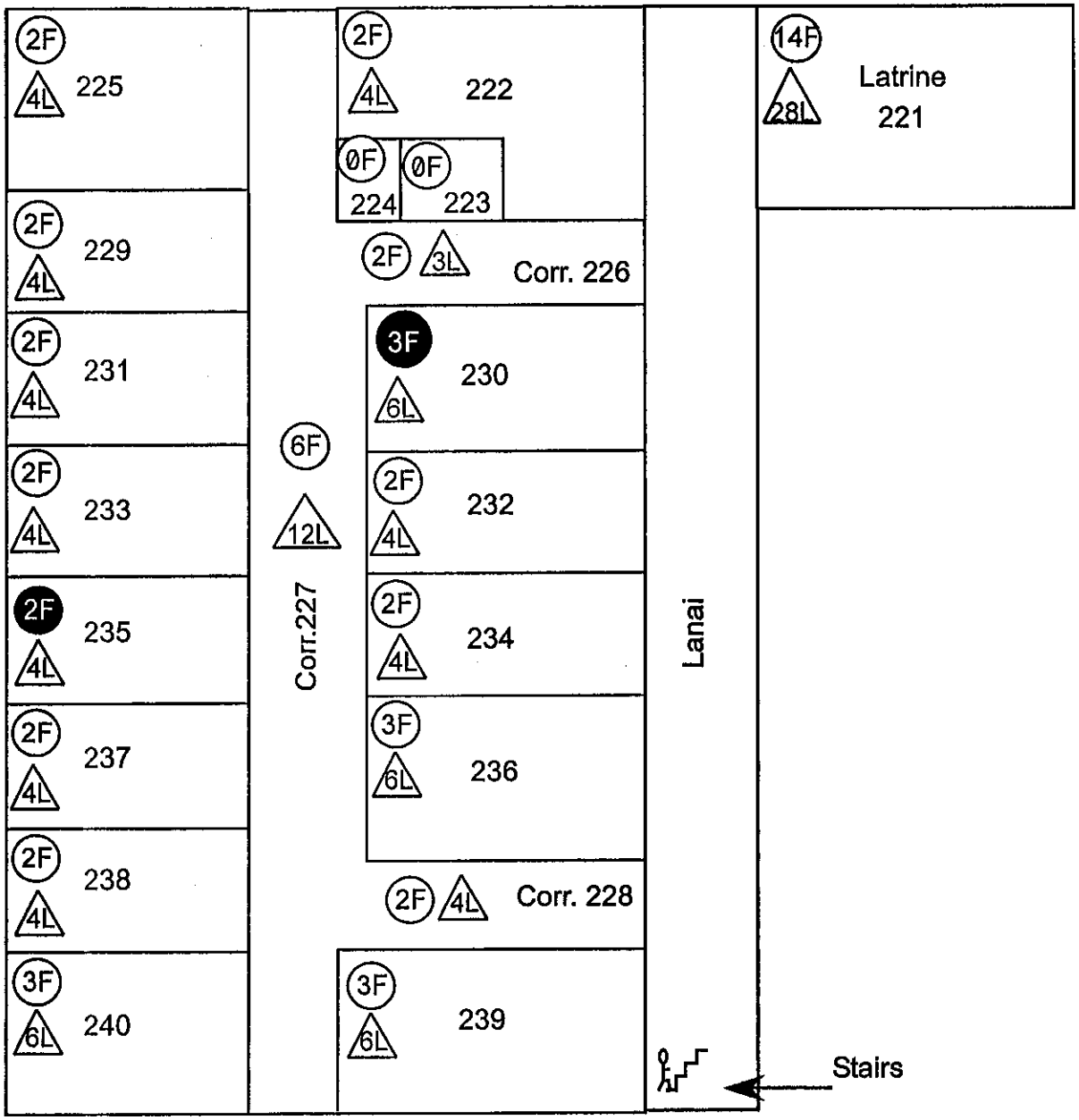
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-2-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

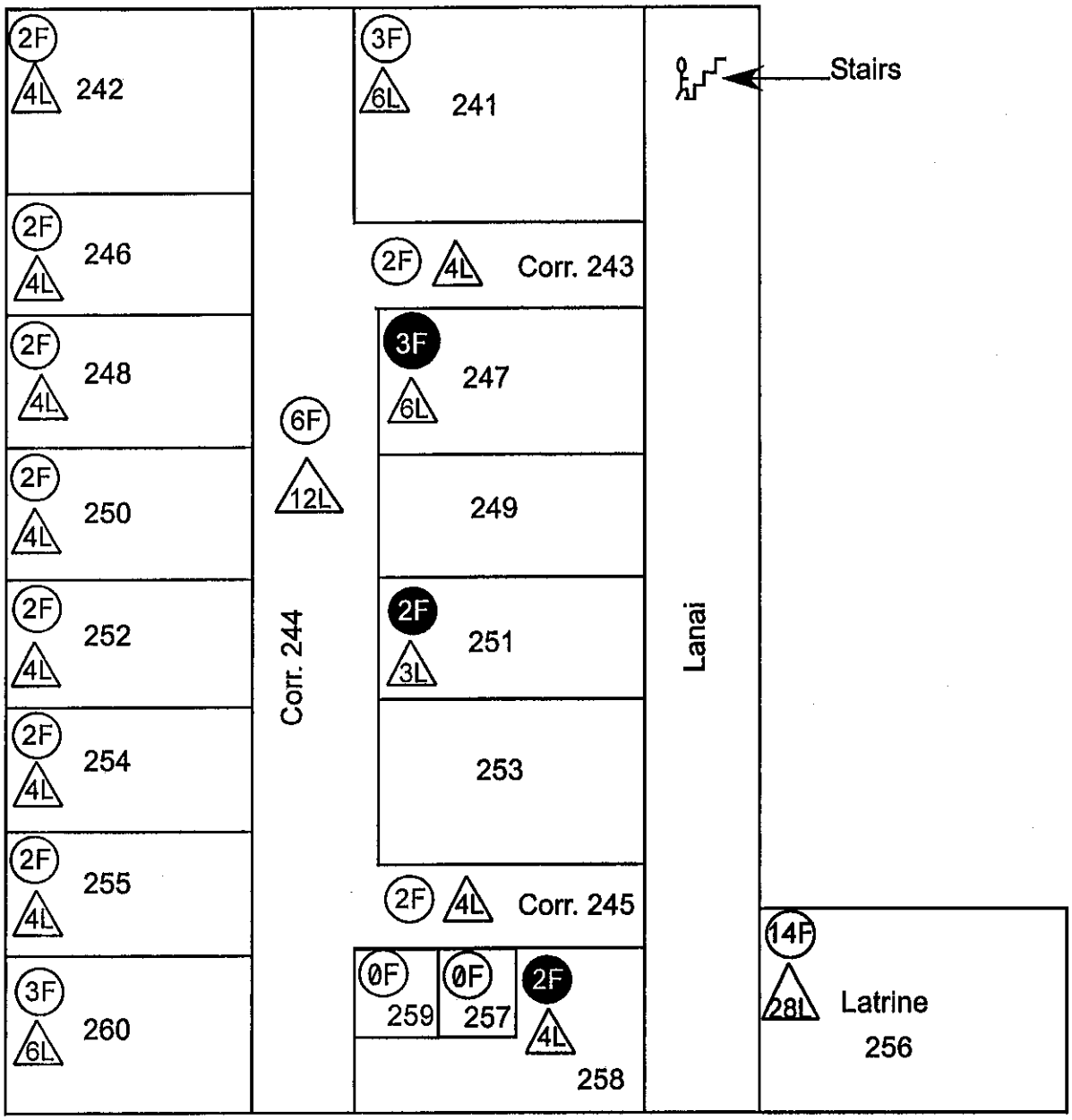
# QUAD C SCHOFIELD BARRACKS
## SKETCH 357-2-B




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

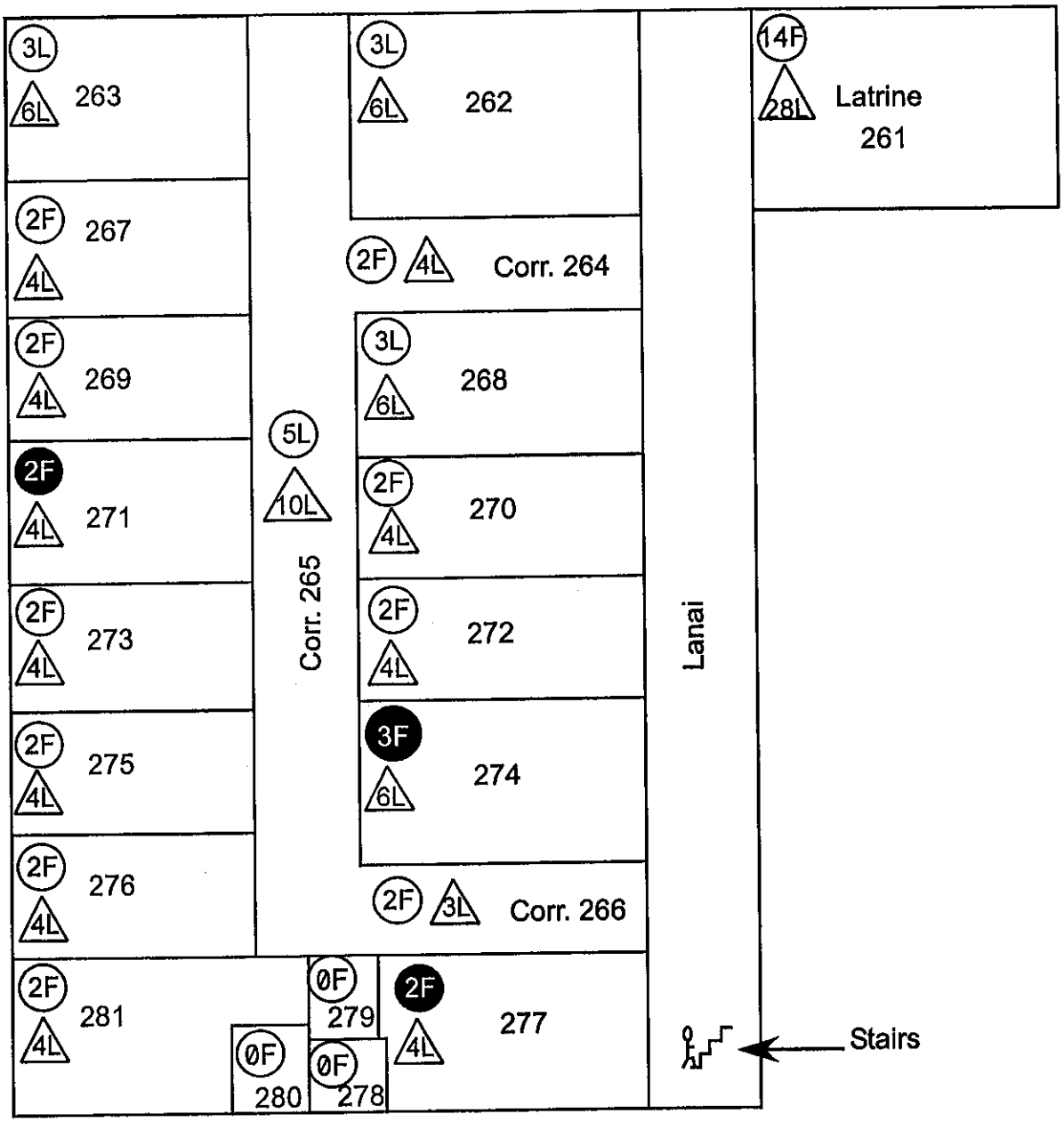
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-2-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

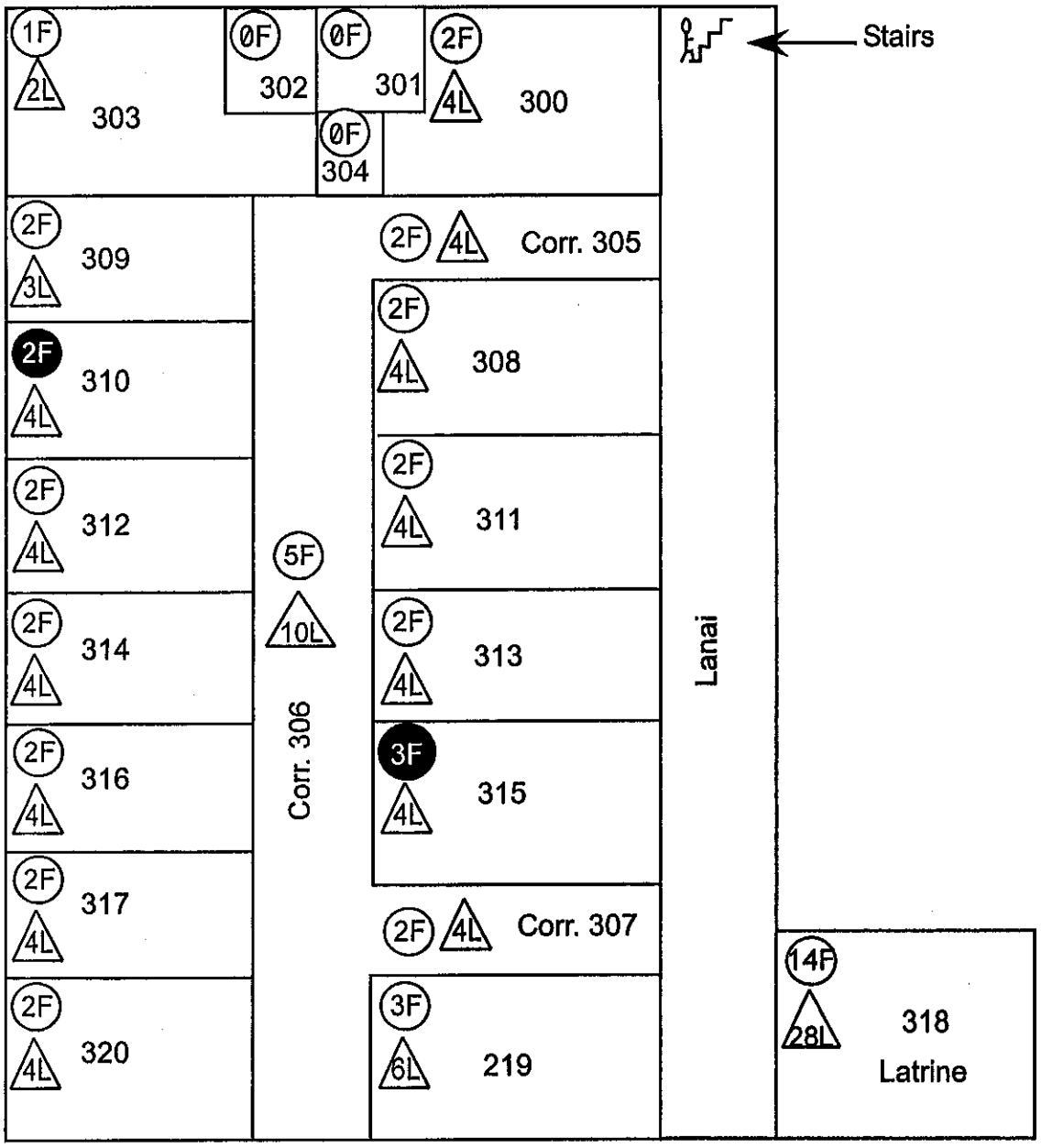
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-2-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

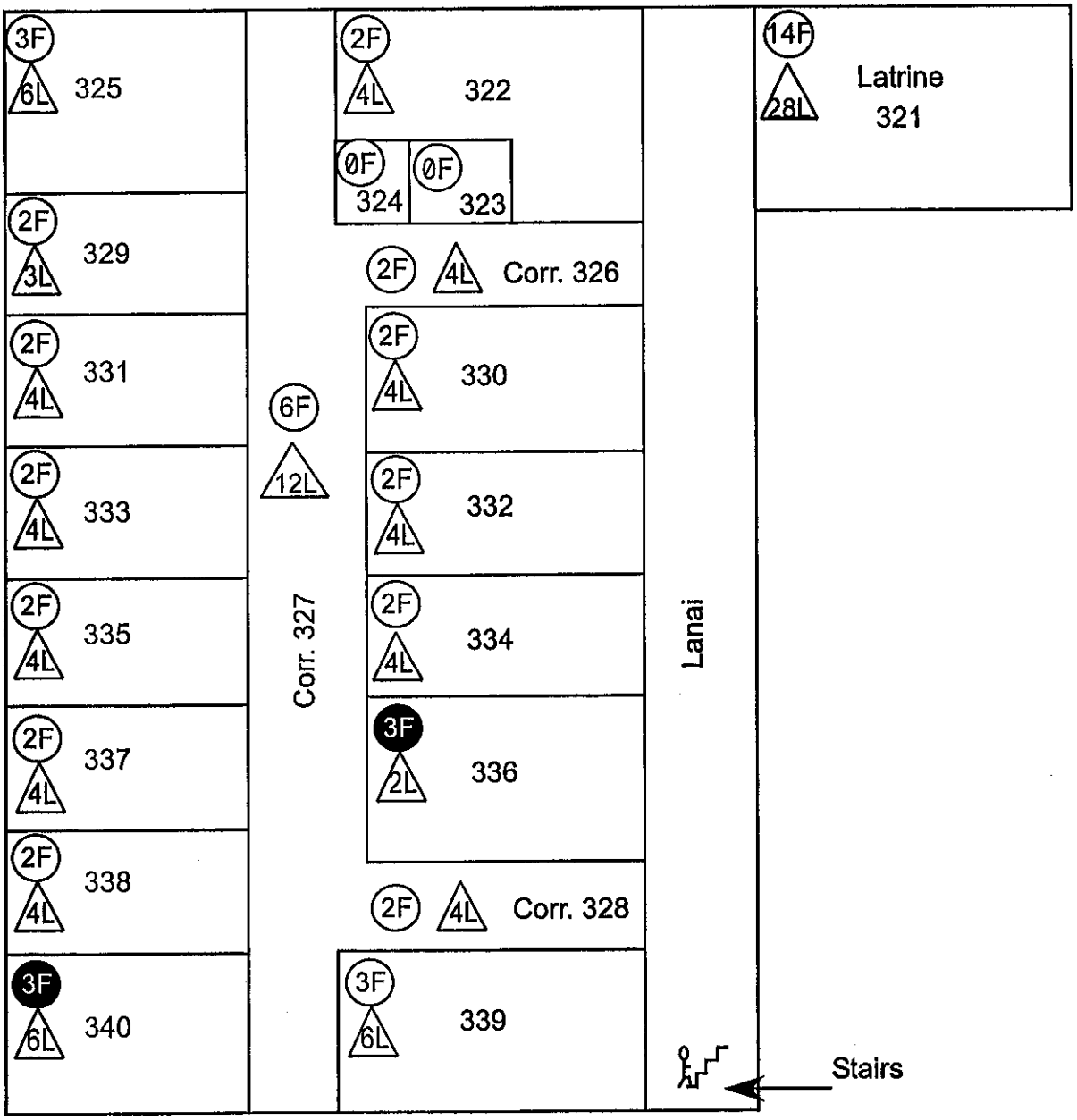
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-3-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

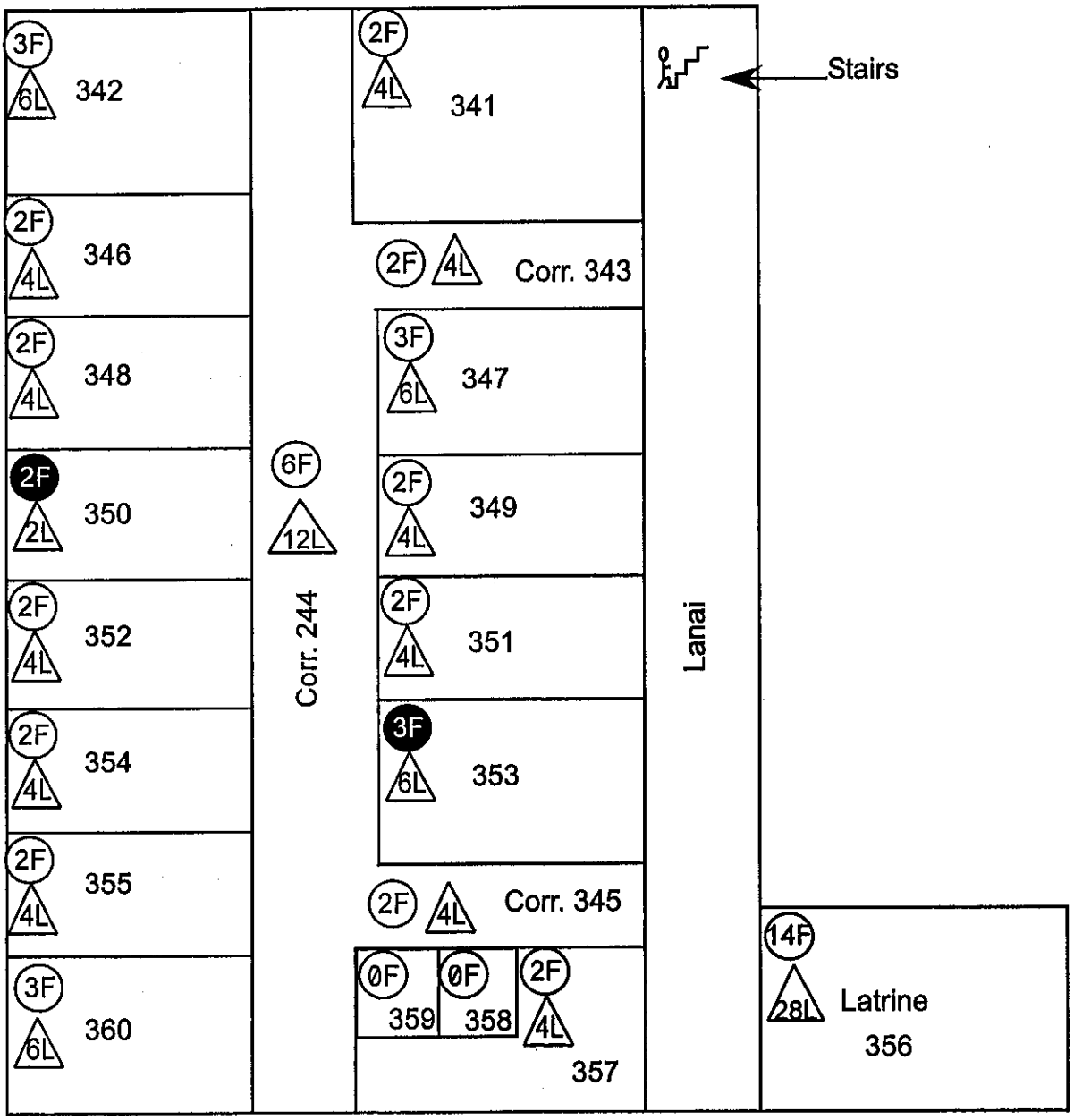
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-3-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

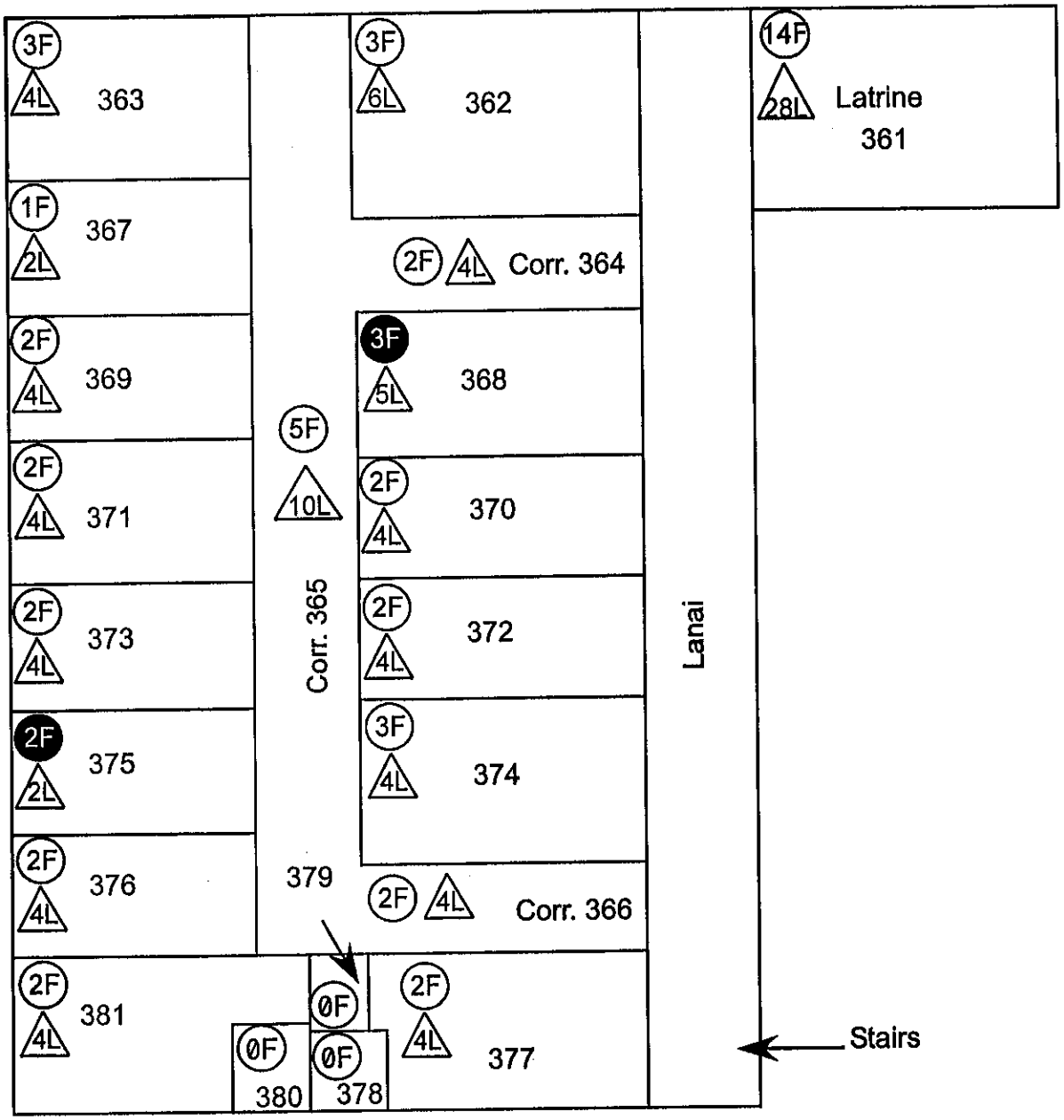
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-3-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

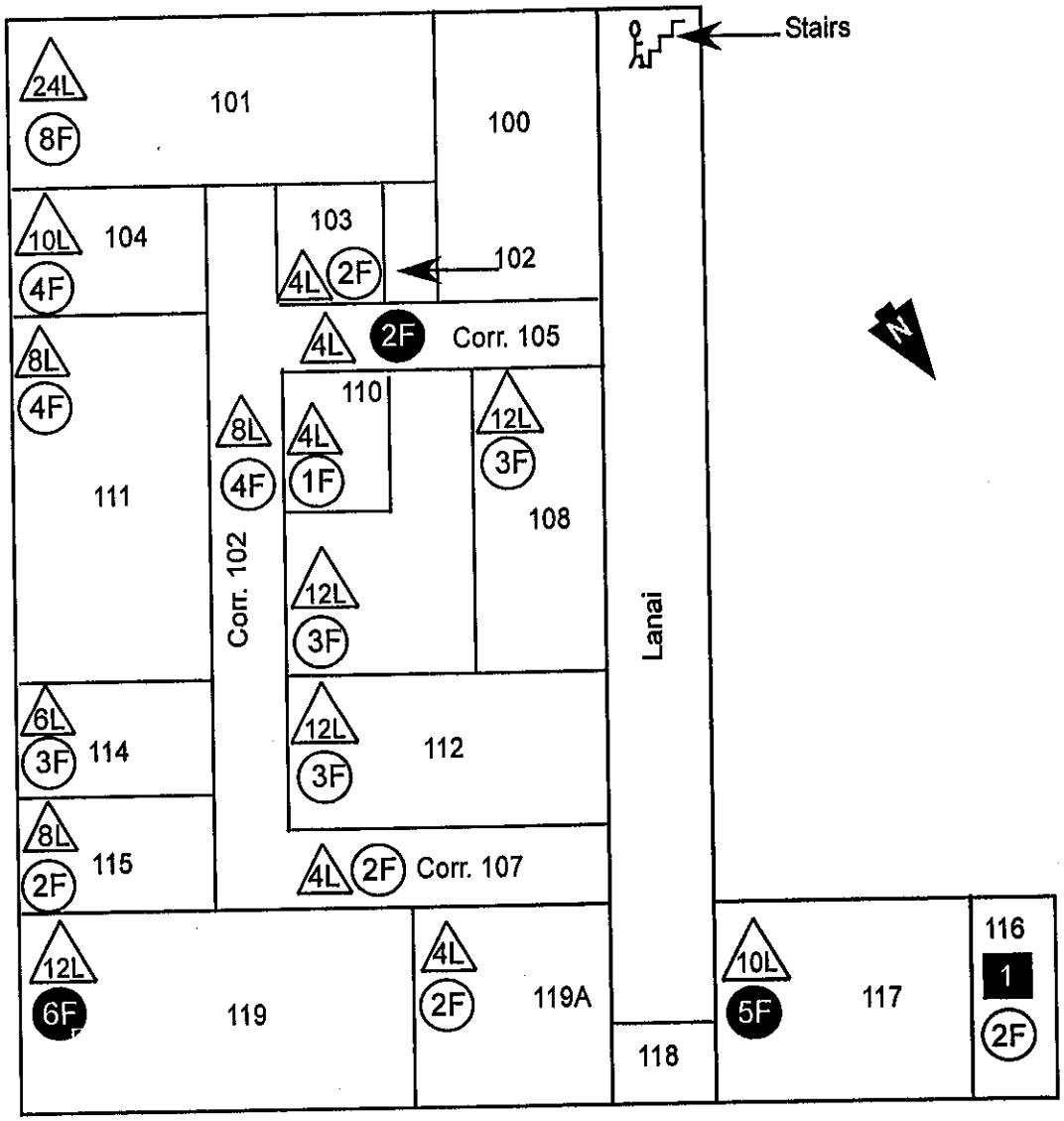
# QUAD C SCHOFIELD BARRACKS
# SKETCH 357-3-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

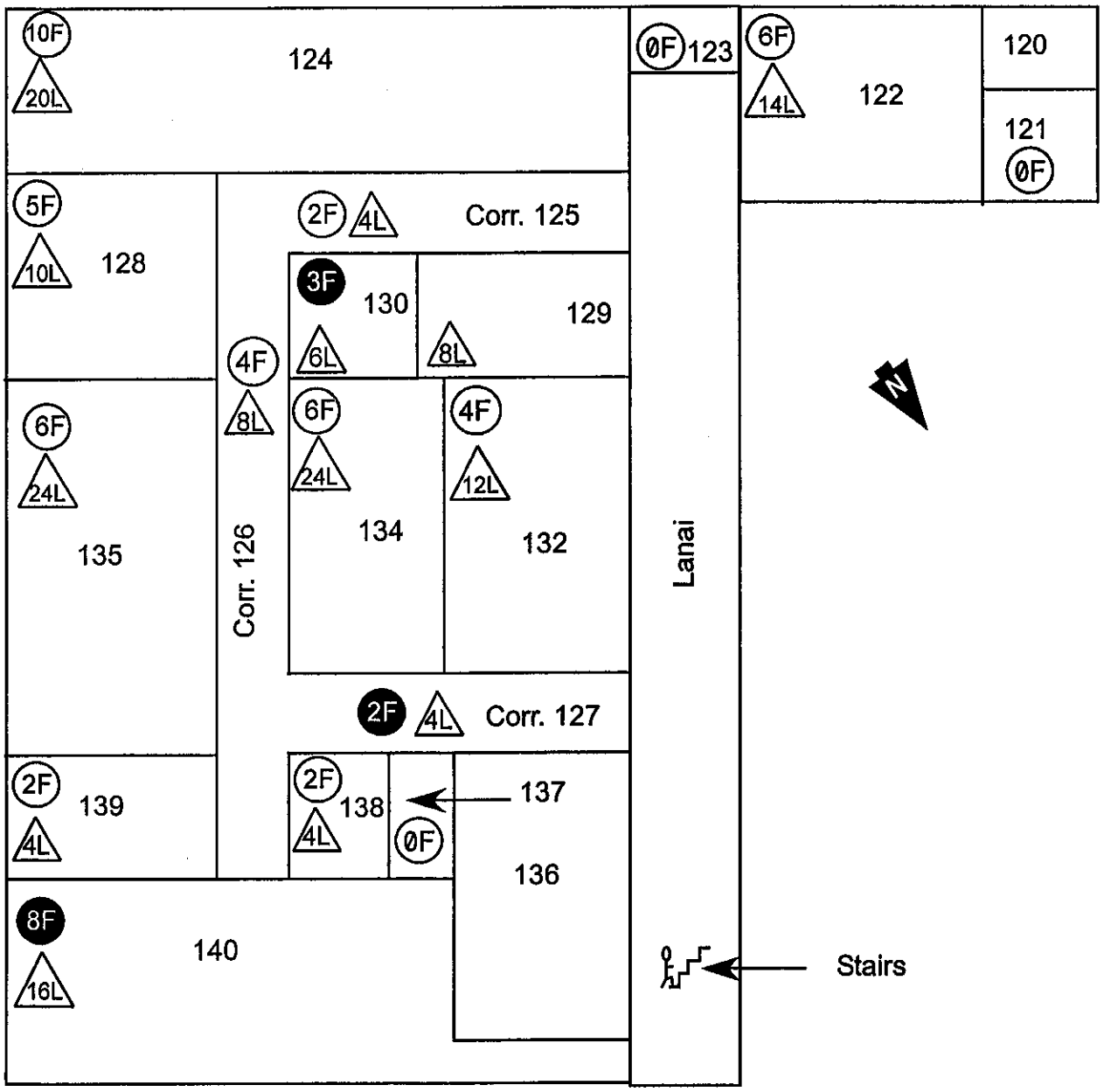
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-1-A




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

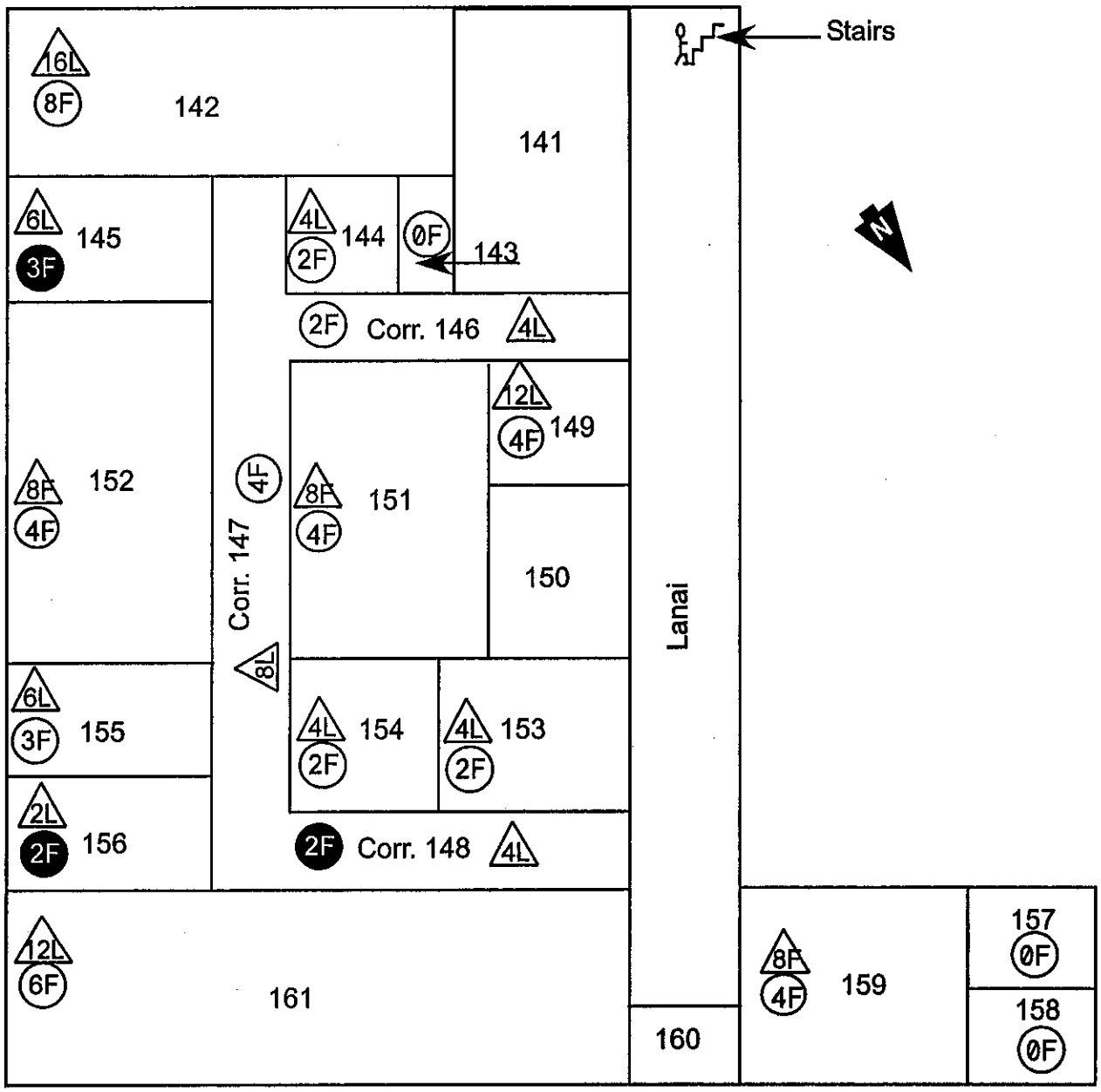
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-1-B




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

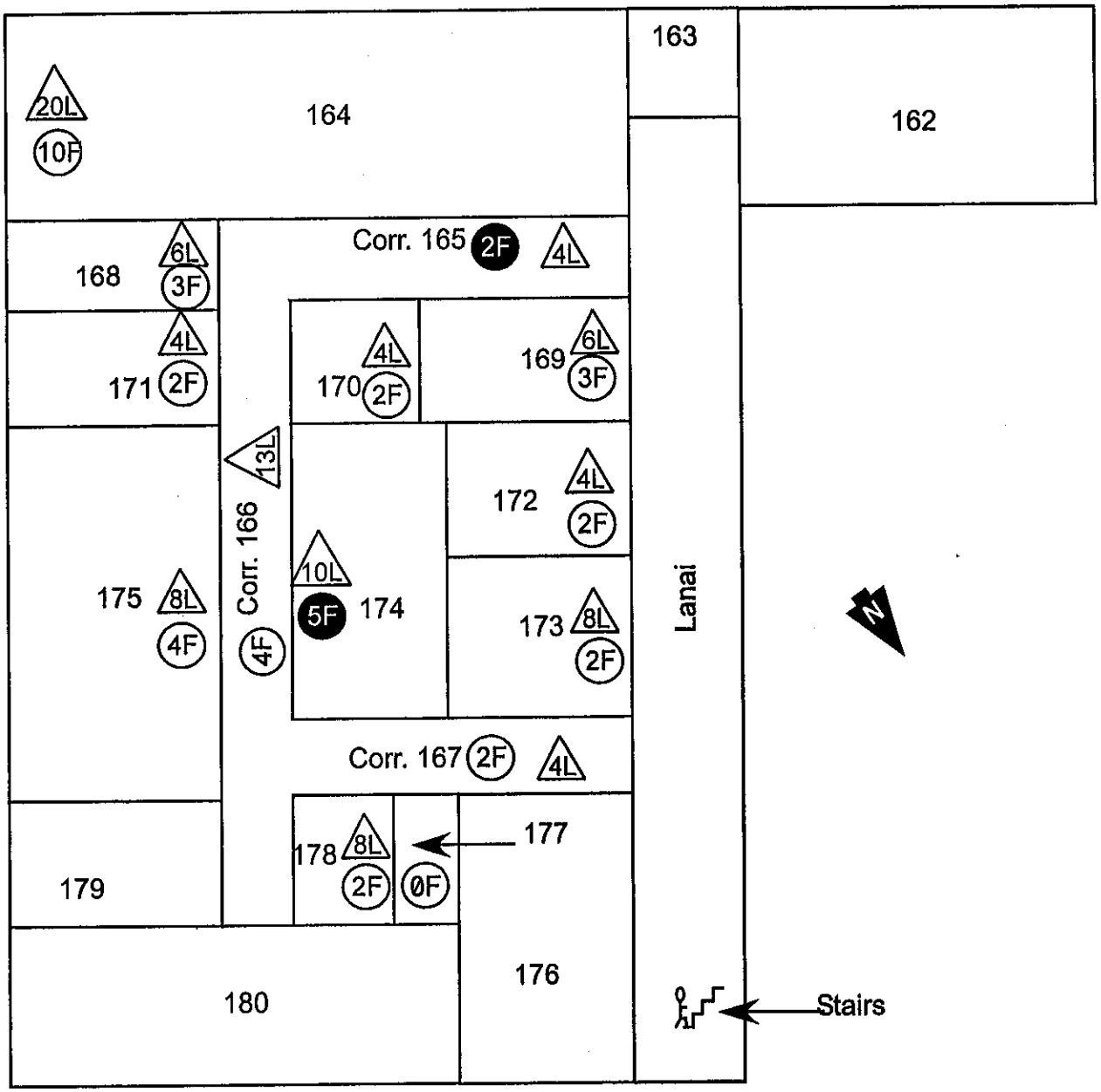
# QUAD C SCHOFIELD BARRACKS
## SKETCH 358-1-C




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

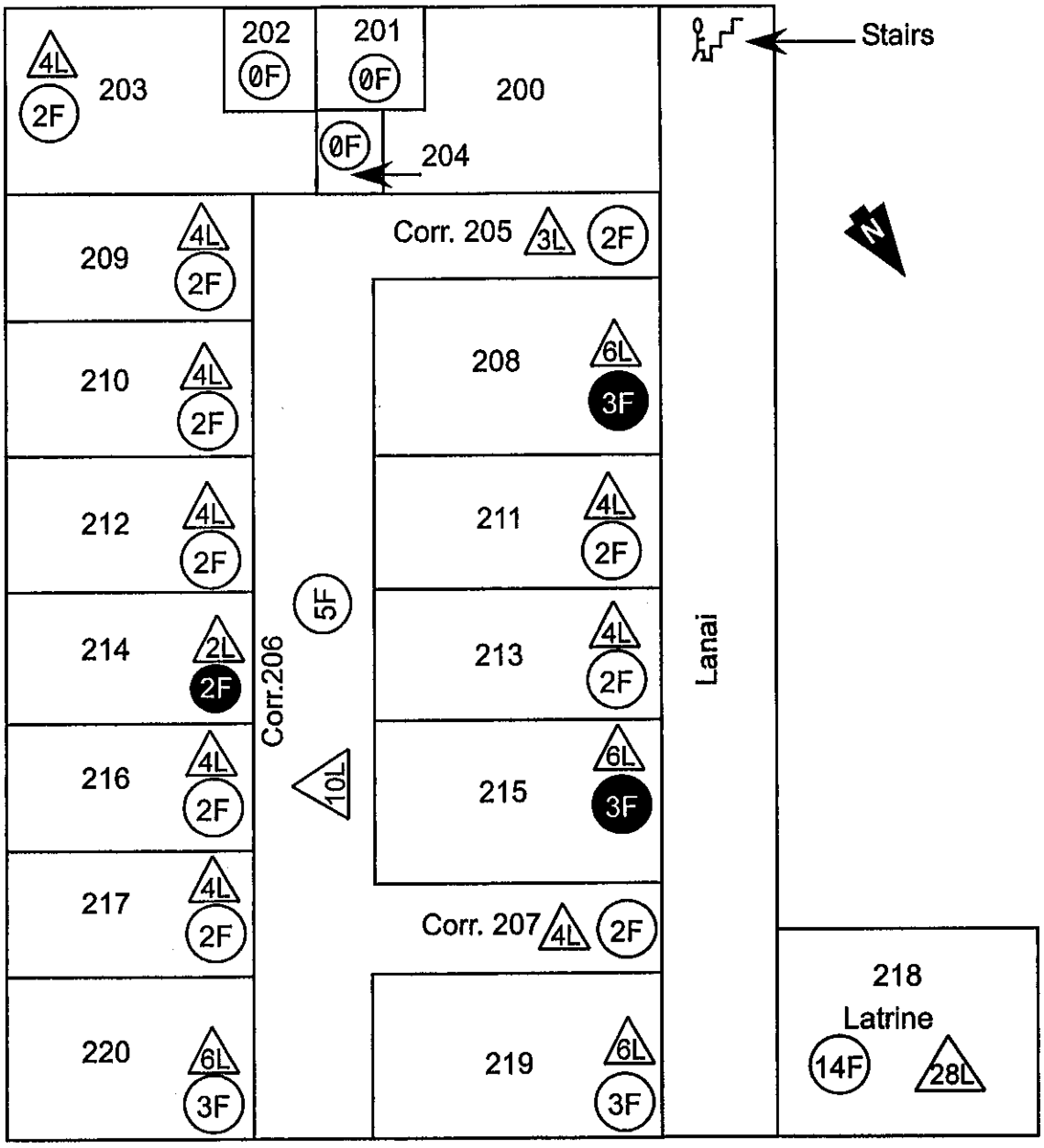
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-1-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

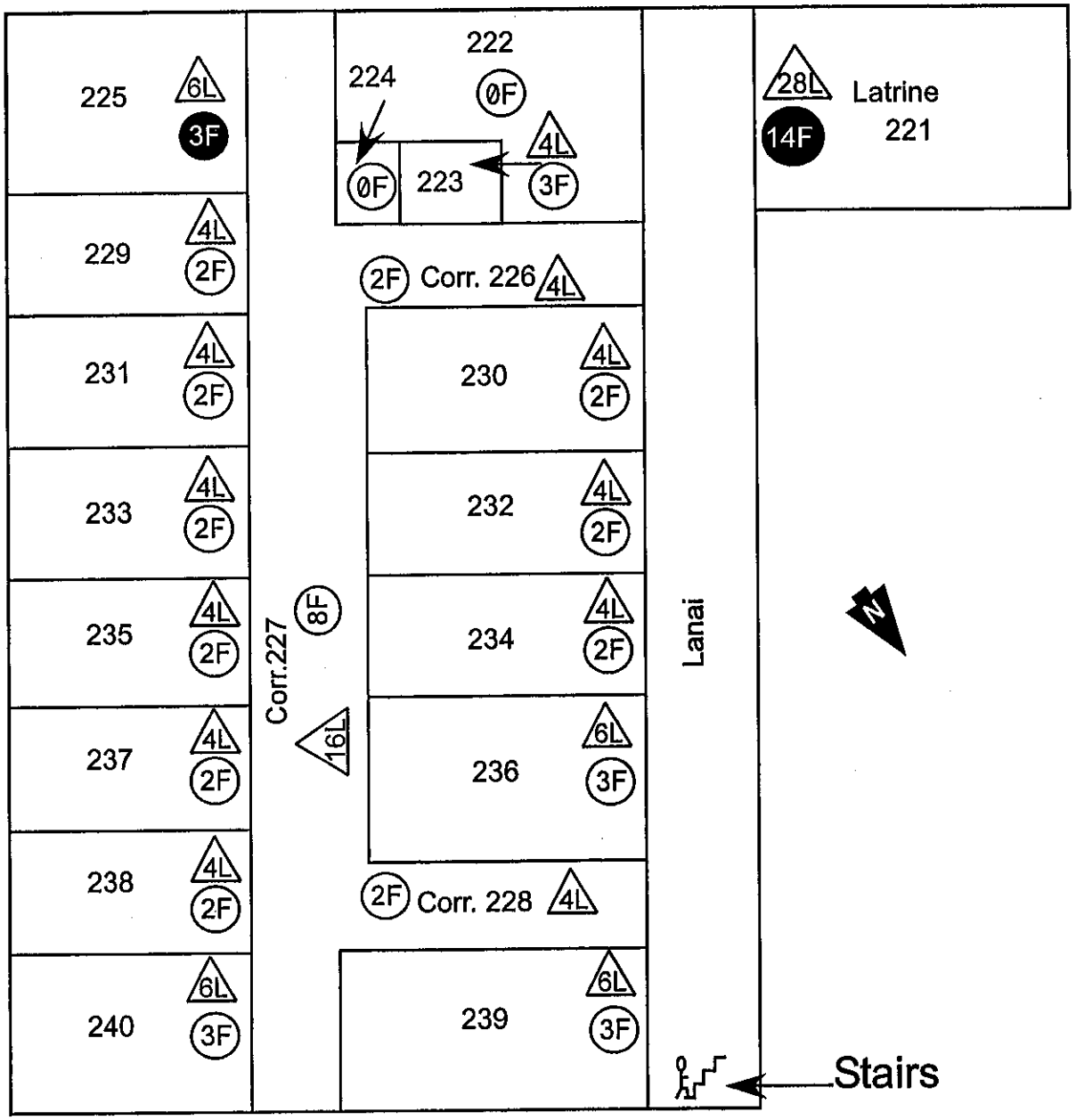
# QUAD C SCHOFIELD BARRACKS
## SKETCH 358-2-A




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

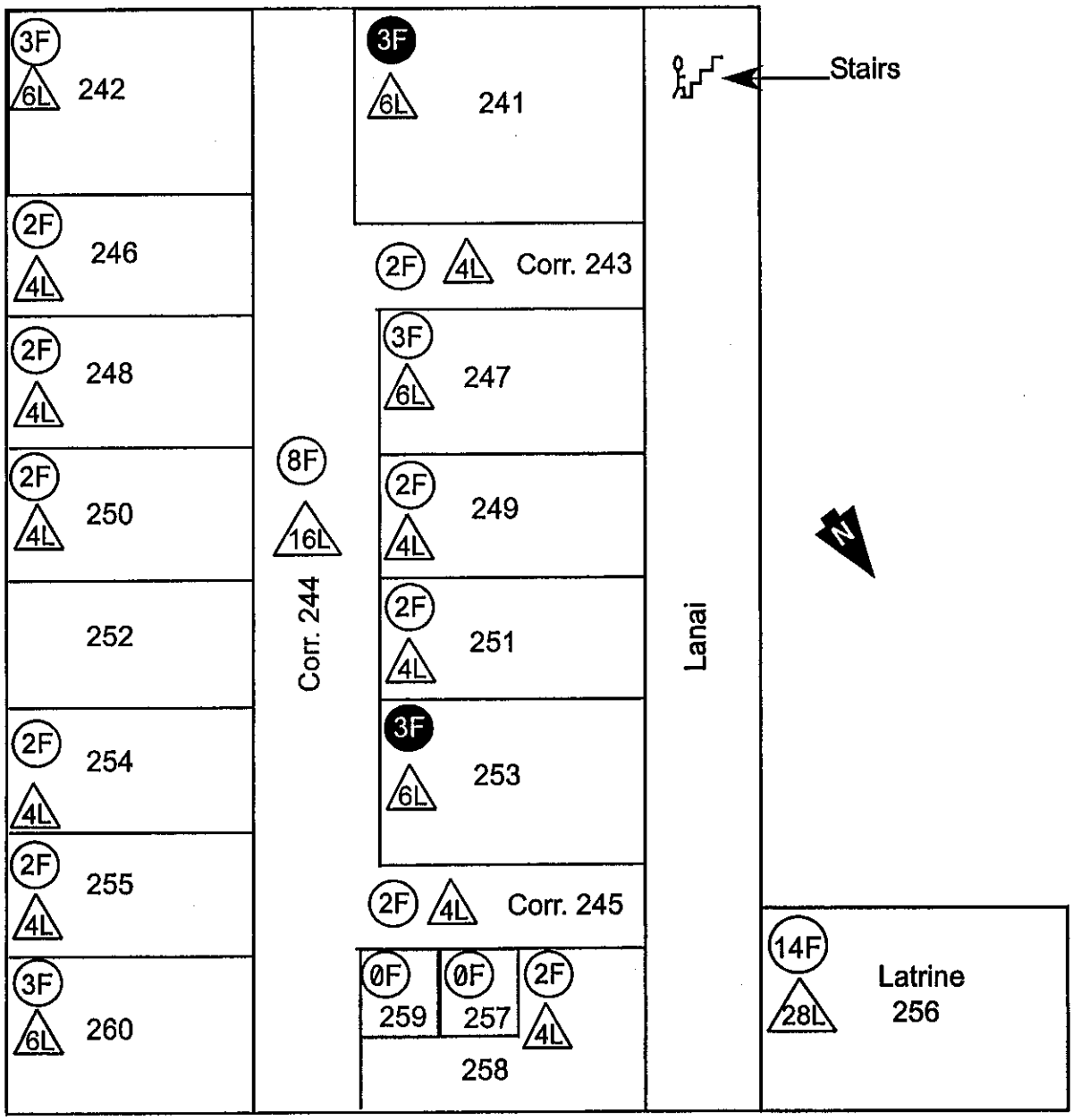
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-2-B




**Legend**

| | | | |
|---|---|---|---|
| (2F) | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

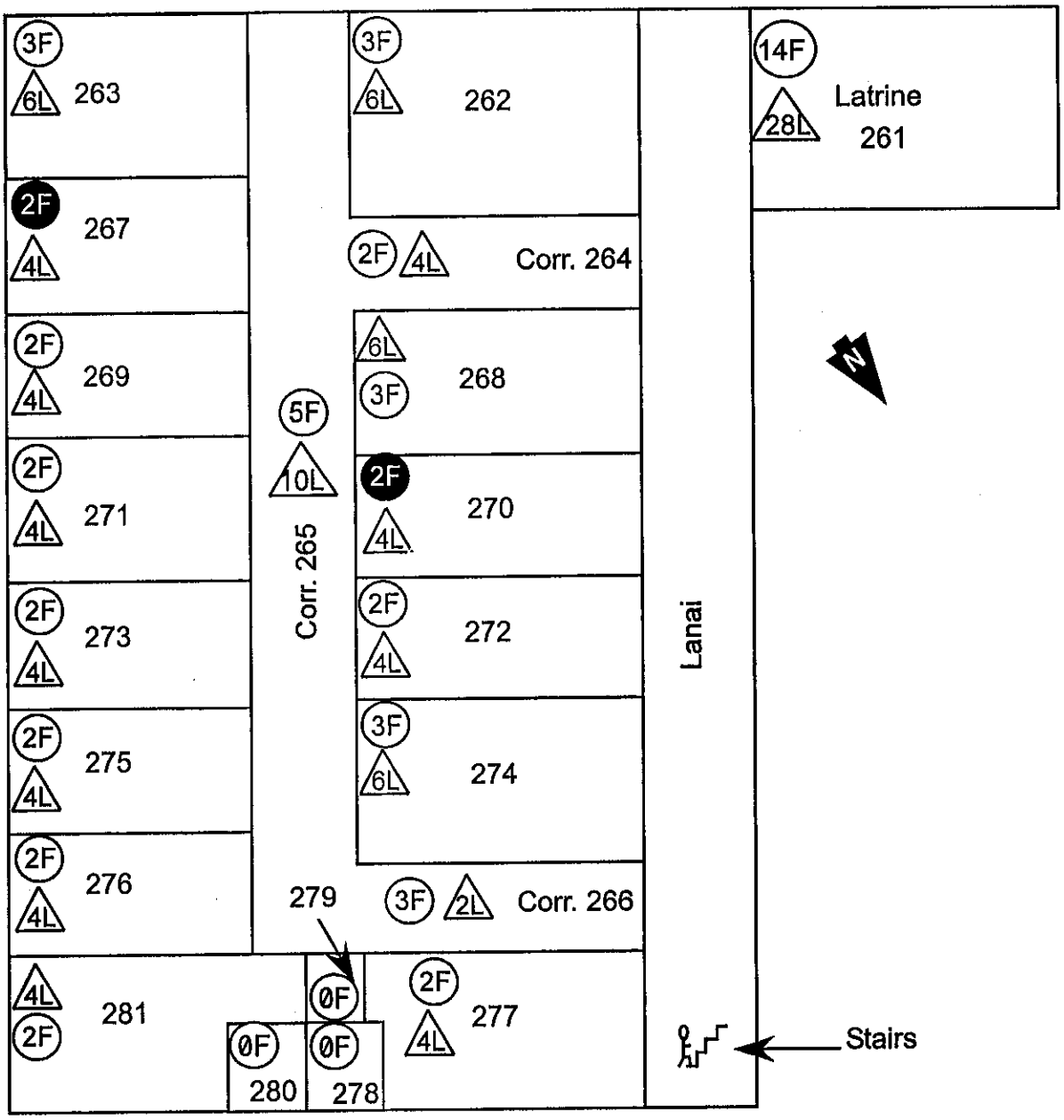
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-2-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

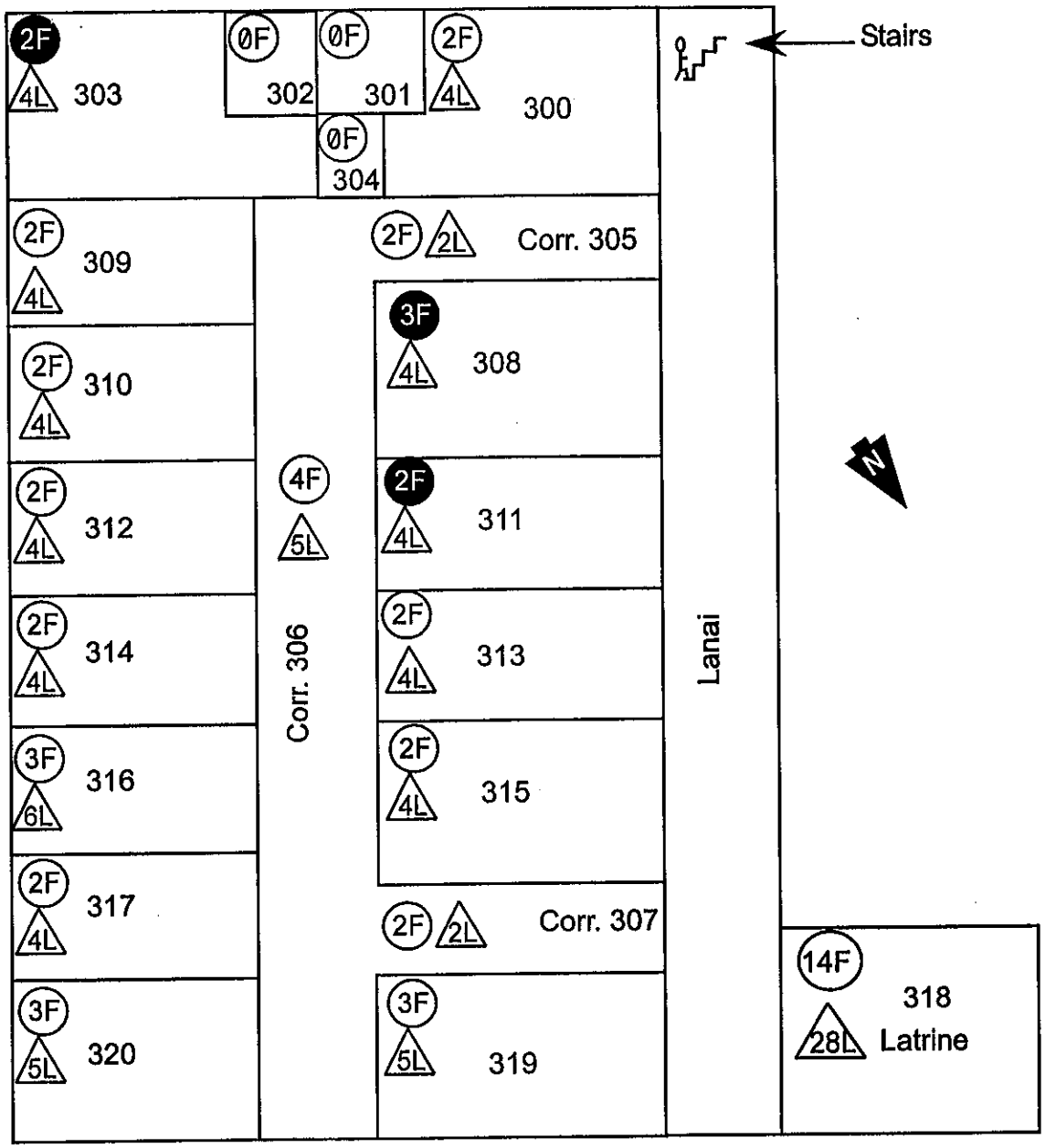
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-2-D




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

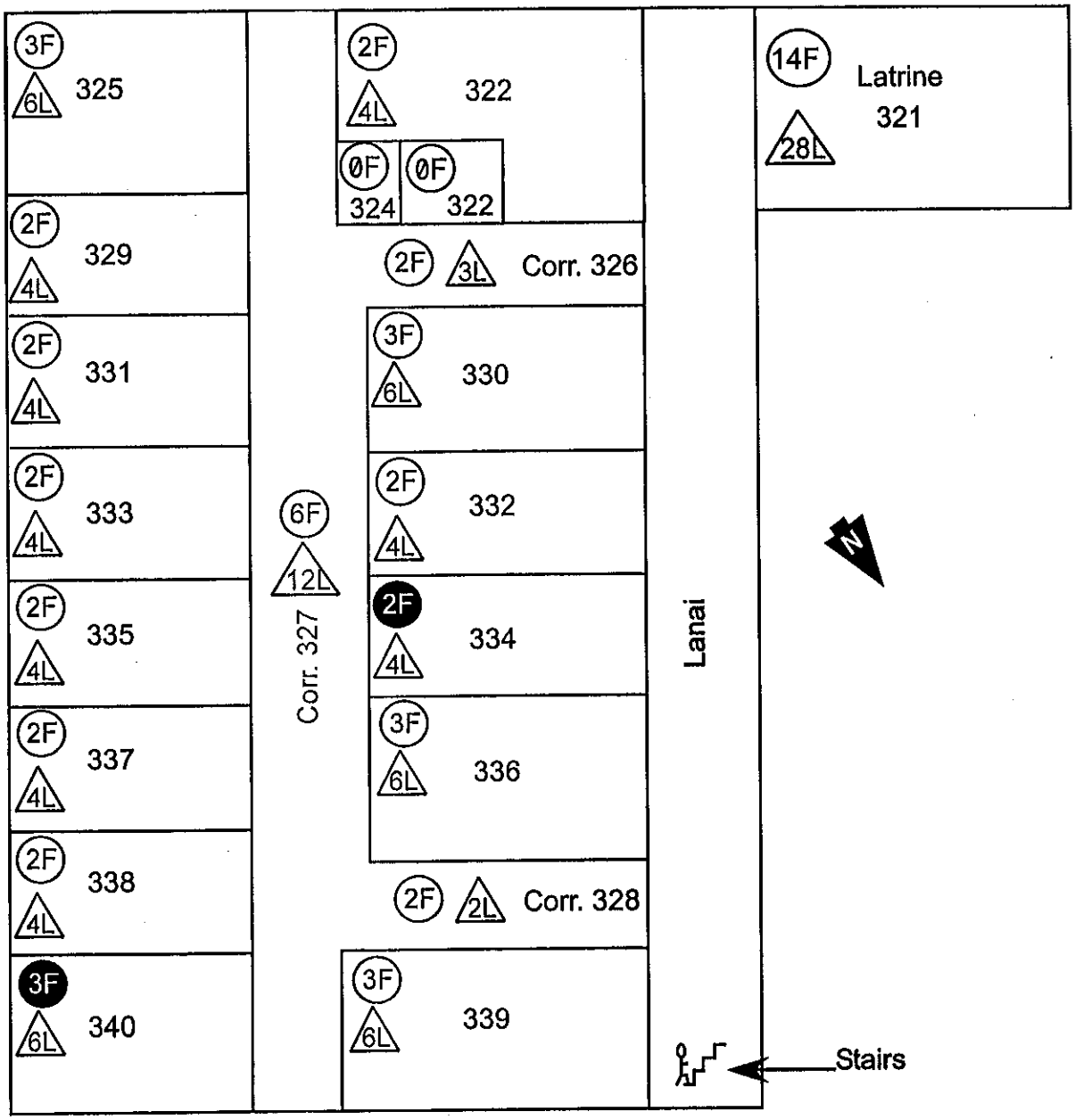
# QUAD C SCHOFIELD BARRACKS
## SKETCH 358-3-A




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

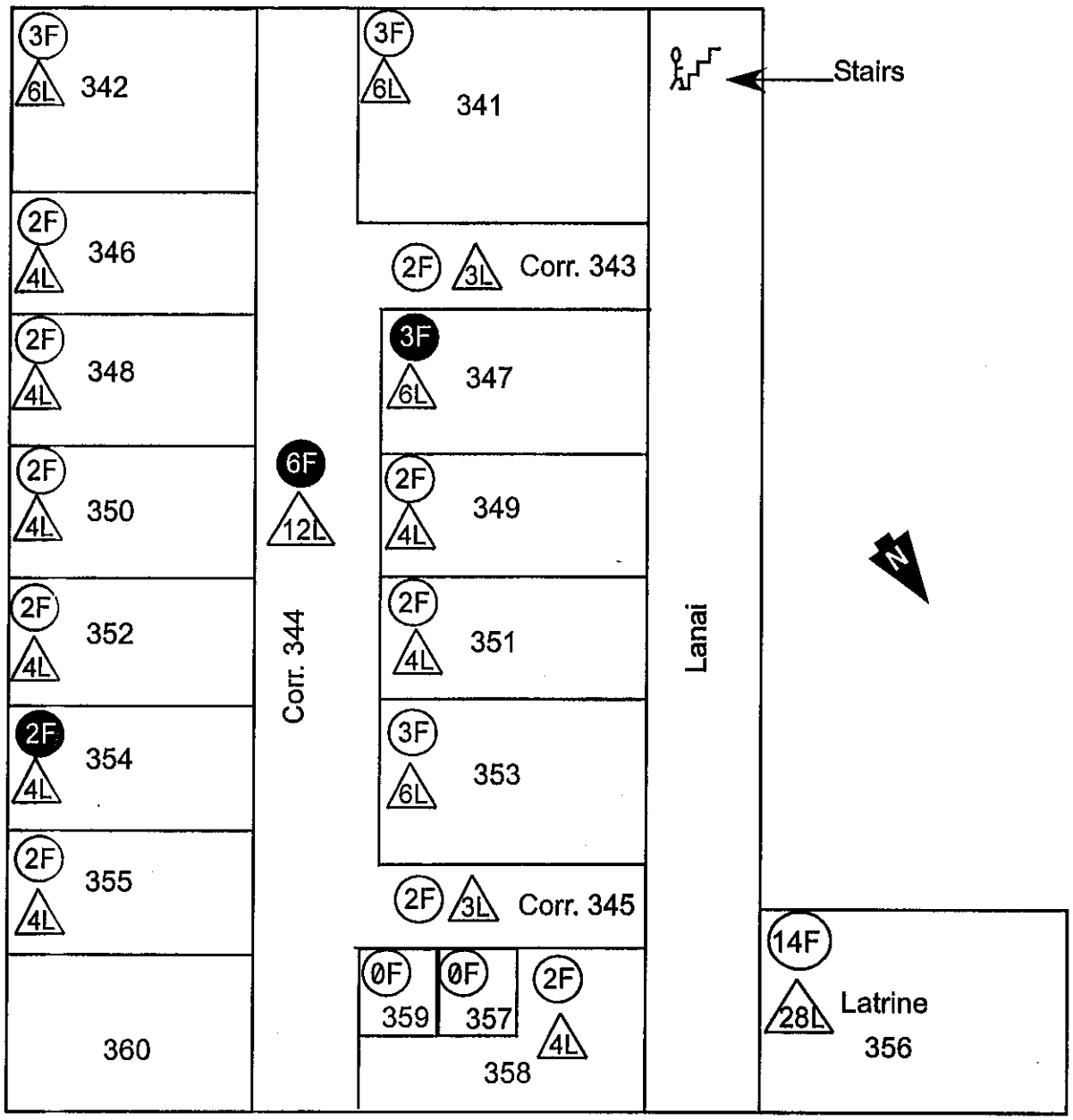
# QUAD C SCHOFIELD BARRACKS
## SKETCH 358-3-B




**Legend**

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

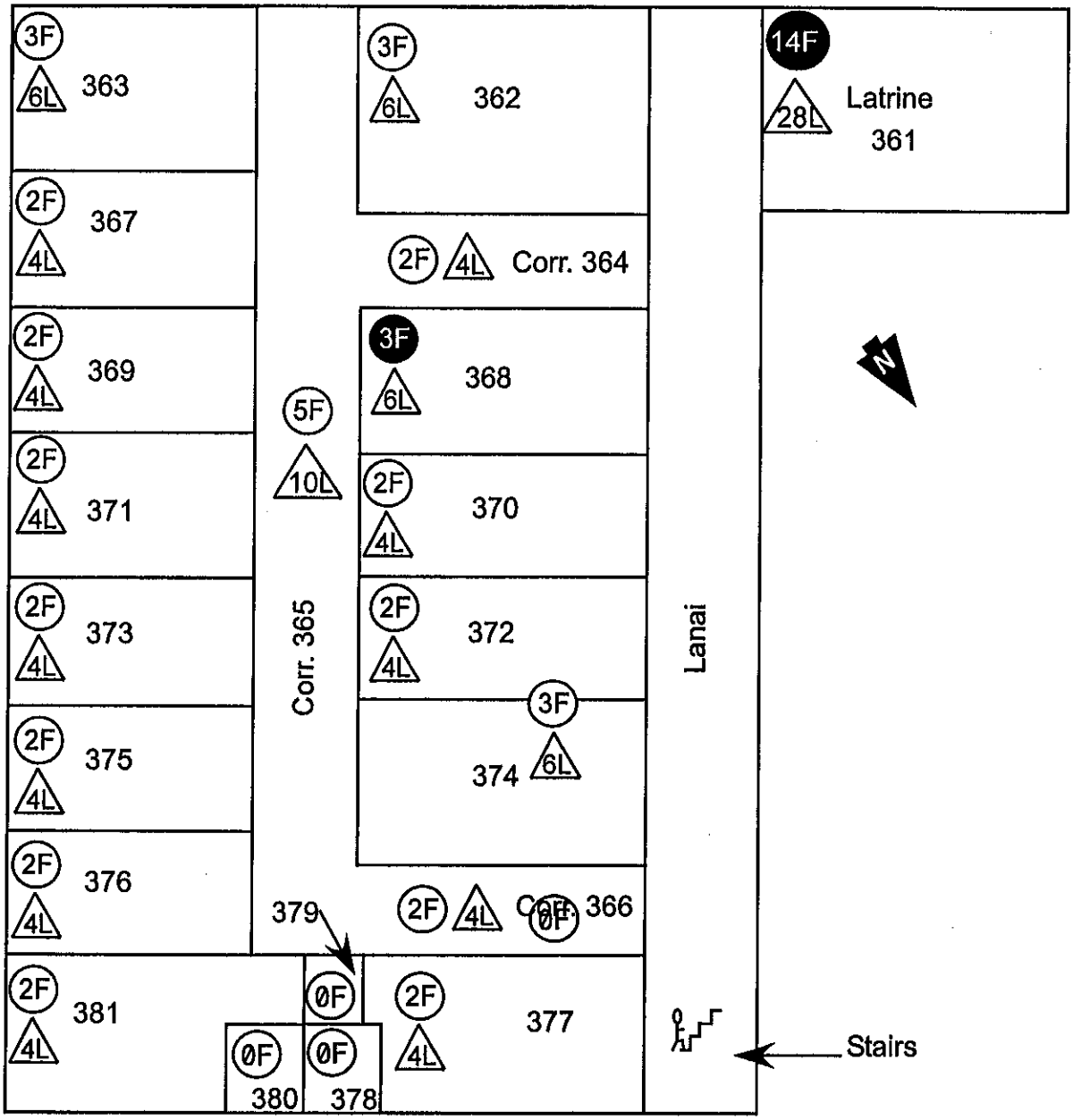
# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-3-C




## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | 356-2-A | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

# QUAD C SCHOFIELD BARRACKS
# SKETCH 358-3-D

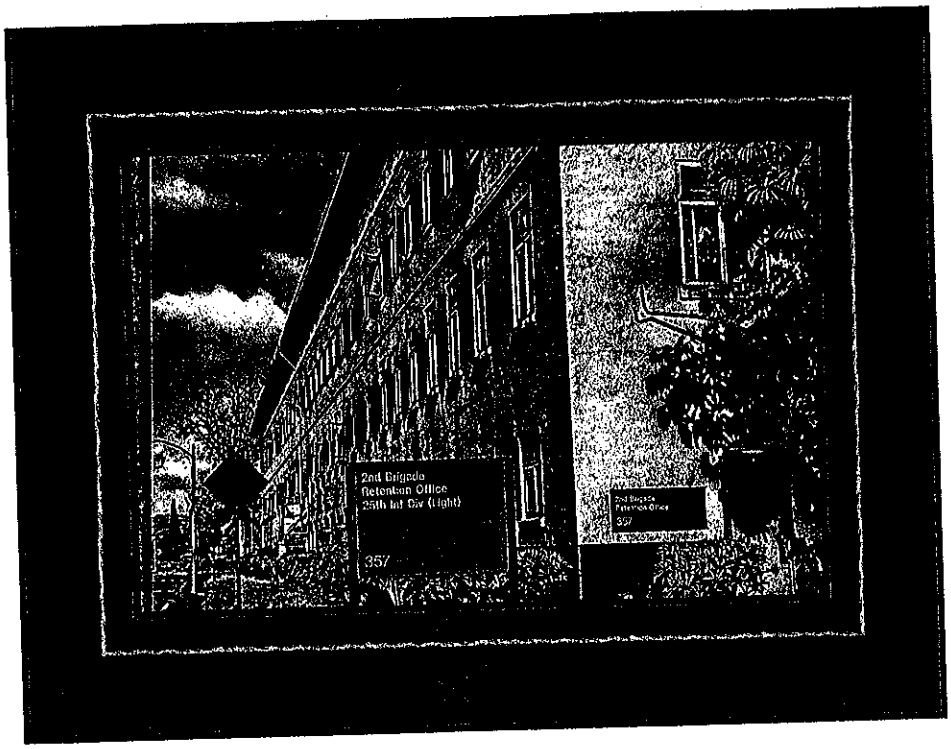



## Legend

| | | | |
|---|---|---|---|
| 2F | Light fixtures (2) | **356-2-A** | Building 356/2nd fl/section A |
| 6L | Mercury lamps | 220 | Room number |
| 2F | Light fixtures investigated (2) | | |
| 1 | PCB-containing ballast | | |

ATTACHMENT 19

ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS 357 AND 358




# ASBESTOS INSPECTION REPORTS

## Schofield Barracks
## Quad C - Buildings 357 and 358

**Submitted to**

**U.S. Army Corps of Engineers**
**Honolulu Engineer District**
**Attn: CEPOH-EC-E, Building 230 (Miriam Koyanagi)**
**Fort Shafter, Hawaii 96858-5440**

**Submitted by**

**Soil and Land Use Technology, Inc.**
**3375 Koapaka Street, Suite B286**
**Honolulu, Hawai'i 96819**

**Contract DACA83-01-D-0017**
**Task Order #0001**

**March 2003**

# PREFACE

These two volumes contain the asbestos reinspection reports for Quad C at Schofield Barracks. Quad C consists of Buildings 355, 356, 357, and 358. The asbestos reinspections were performed by Soil and Land Use Technology, Inc. under Task 0001 of Contract #DACA83-01-D-0017. The reinspections were performed between November 30, 2001 and March 12, 2002.

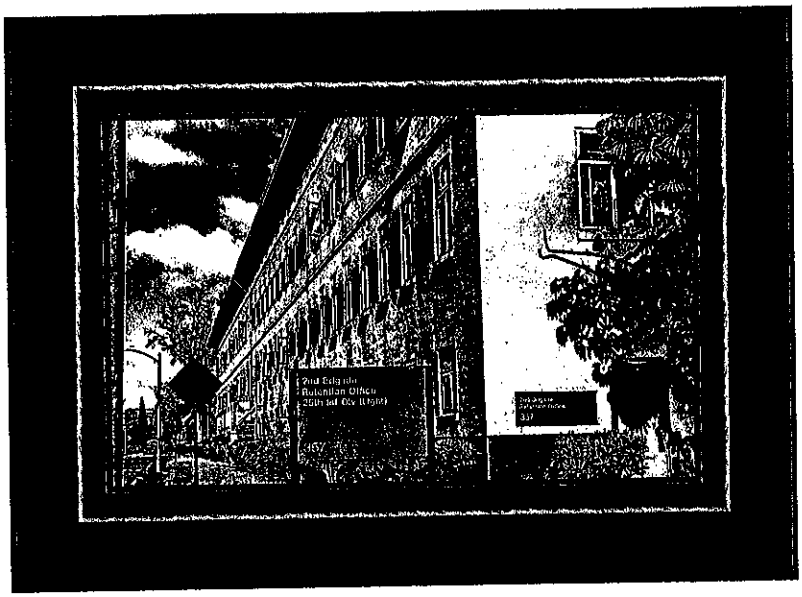
The following information is provided in each report:

- ❑ Name and location of the building inspected
- ❑ Date the inspection was performed
- ❑ Names of the certified inspectors who conducted the inspection
- ❑ Summary tables describing the type, location, condition, and quantity of identified asbestos containing materials
- ❑ Discussion of findings and recommendations
- ❑ Photographs of all identified asbestos containing materials
- ❑ Building drawings in Microstation® format, with sample numbers and locations of asbestos-containing materials indicated
- ❑ Laboratory sample analysis results and chain of custody documents for each sample collected from the building

Following the building inspection reports are the Sampling and Analysis Plan (SAP) for Task 0001 and certifications of the inspectors and analytical laboratories that participated in the surveys. The SAP details the methodology used in performing the inspections, including discussion of applicable regulations and sampling protocols. The certifications include the following:

- ❑ Asbestos Hazard Emergency Response Act (AHERA) Inspector certificates
- ❑ State of Hawai'i Inspector cards
- ❑ National Voluntary Laboratory Accreditation Program (NVLAP) certificates and State of Hawai'i certification letters for analytical laboratories

# Schofield Barracks



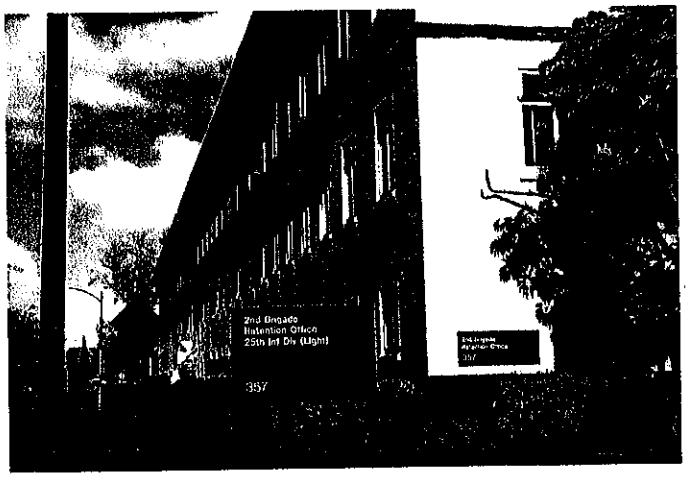

# Building 357

# Executive Summary

Soil and Land Use Technology, Inc. (SaLUT) performed an asbestos identification and assessment reinspection of Building 357 located at Schofield Barracks, Hawaii. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 357 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included to the extent that the suspect materials found in those surveys could be identified. The survey was conducted by SaLUT in accordance with the U.S. Army Corps of Engineers Honolulu Engineer District Scope of Work dated September 18, 2001. The survey was conducted December 11, 2001 through February 19, 2002.

All accessible areas of the building were inspected for suspect asbestos-containing building materials (ACBMs). One hundred and sixty samples of suspect asbestos containing material were collected. Analytical results confirmed that asbestos is present as floor tile, floor tile mastic, and caulking. A summary of the ACBMs encountered is provided on the next page. This report provides a detailed description of the ACBM locations, quantities, and hazard assessments based on conditions existing at the time of the inspection. No areas were found to contain ACBM causing high or imminent exposure potential.

*Photograph 1. Front of Building 357.*




*Photograph 2. Rear of Building 357.*

## BUILDING SUMMARY

| | |
|---|---|
| **Facility** | Schofield Barracks |
| **Building** | 357 |
| **Inspector(s)** | John Willard, Kenneth Reynolds, John Veitch |
| **Inspection Date(s)** | December 11, 2001 through February 19, 2002 |
| **Building Area** | 90,000 s.f. |

**Inaccessible areas (overview)**

None

**Areas with limited access (overview)**

Beneath wall-to-wall carpeting ("LCA" on building drawings)

**Areas with no access (overview)**

Above ceilings with no access ("NAC" on building drawings)
Rooms that were sealed ("NA" on building drawings)

| Types of ACBMs Encountered | | Approximate Quantity |
|---|---|---|
| **Thermal System Insulation** | None | |
| **Surfacing** | None | |
| **Miscellaneous** | Caulking<br>Floor tile<br>Floor tile mastic | 10 lf<br>5,776 sf<br>41,311 sf |
| **Functional Areas with High to Imminent Exposure Potential** | None | |

*Photograph 3. Side of Building 357.*

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| | Analytical Laboratory Results and Chains of Custody | Following Section 4 |
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# 1 Introduction

SaLUT performed an inspection of Building 357 to identify and assess all accessible ACBMs. This was a reinspection conducted at various times between December 11, 2001 and February 19, 2002 in accordance with the requirements outlined in the Scope of Work dated September 18, 2001. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 357 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included.

The following is a description of the building:

| | |
|---|---|
| **Function** | Barracks |
| **Size** | 90,000 square feet; three floors |
| **Foundation** | Concrete |
| **Exterior walls** | Concrete masonry units with plaster coating |
| **Roof** | Metal |
| **Mechanical systems** | Main mechanical room containing furnace and boiler on First Floor; secondary mechanical rooms on Second and Third Floors; pipes are insulated with fiberglass, rubber, and foam |
| **Climate control** | Central heating system; individual room air conditioning units; ducts are insulated with fiberglass |
| **Interior walls** | Concrete masonry units, drywall, plaster |
| **Floors** | Floor tile, concrete, ceramic tile, carpet |
| **Ceilings** | Ceiling tiles; fixed ceilings with ceiling plaster in some spaces |

Survey and assessment protocols were based on those adopted by the U.S. Environmental Protection Agency (EPA) as detailed in the Asbestos Hazard Emergency Response Act (AHERA; 40 CFR 763, Subpart E), and those of the Hawaii Department of Health in Hawaii Administrative Rule (HAR) 11-502 *Asbestos-Containing Materials in Schools.* In addition to identifying materials considered suspect by AHERA survey protocols, accessible roofing and other exterior materials were also addressed. SaLUT's inspectors identified and sampled all materials considered to be suspect under the regulations and other documents listed in Section 2 *Applicable Documents,* as well as those materials that have been found through other available literature and inspectors' experience (e.g., leveling paper and silver exterior paint) to potentially contain asbestos. This report does not address those suspect materials that would be expected in the building (e.g., sink undercoating in bathrooms of a residence)but were not encountered; the reader should assume that, if a suspect material is not mentioned in Section 3 *Findings,* the material was not found in the building.

For the following reasons, SaLUT's survey differed from a normal reinspection, wherein the locations and conditions of previously identified ACBMs are verified, and the impacts of building renovations are determined:

- **Inability to identify the Baker survey's homogeneous materials with certainty.** Photographs of the positive materials were not included in the Baker inspection report available at the Directorate of Public Works (DPW). Many of the types of floor tile in the original survey were described by their predominant color only. Other types of floor tile appear to have received more than one description (possibly due to having been described by different inspectors).

- **Multiple layers of floor tile.** Many rooms had multiple layers of floor tile. Numerous instances were identified where floor tile located in the 1993 survey had been covered by other types of tile. This made it impractical to carry out the following tasks with completed accuracy:
  - Verify all locations of floor tiles identified in the original survey
  - Quantify types of floor tile
  - Identify all types of floor tile in the building (it was assumed that all types of floor tile were visible in at least one location)

To deal with these issues, under the direction of SaLUT's Project Manager and Principal Investigator, the inspectors modified the survey protocol as follows:

- **Floor tile.** Where a floor tile type could be sampled by SaLUT's inspectors without causing unacceptable damage, the original inspection was ignored, the floor tile was given a SaLUT homogeneous material identification, and the floor tile was sampled in accordance with the SAP. If the material could be equated to a type of Baker floor tile, this was noted. Where older types of floor tile were noted below SaLUT's samples, but the older materials could not be sampled, the floor tile and associated mastic were identified from the material locations in Baker's report. Quantities of asbestos-containing floor tile and associated floor tile mastic below the top layer of floor tile were assumed to extend throughout the entire room.

- **Other materials identified in previous inspections.** For all other materials (including those that were determined to not contain asbestos) that had been identified in the previous inspections, SaLUT's inspectors attempted to locate the materials. In a number of cases, the materials had been abated during various renovation projects.

  The DPW survey identified two positive materials (thermal system insulation on a 4" diameter pipe in Rooms 100, 103, 108, 110, 120, 260, 366, and thermal system insulation on a 6" pipe in Rooms 105, 108, 119) not identified in the Baker survey. No photograph of this positive material was included in the inspection report. SaLUT's inspectors were unable to locate this material. It is possible that the material was abated.

- **Other materials not identified in previous inspection.** SaLUT's inspectors identified and sampled a number of suspect materials (e.g., types of caulking) that were not identified previously.

- Ceiling Tile. A number of samples were taken by SaLUT to confirm Baker's results that all no ceiling tiles contained asbestos. At that point, SaLUT stopped sampling ceiling tile and Baker's inspection results were accepted.

All samples were collected in accordance with the Sampling and Analysis Plan (SAP) for the task except as noted above. Where applicable, corners of wall-to-wall carpeting were lifted to examine flooring materials under the carpet. Metal roofs that would not support the inspector's weight were examined visually; if suspect materials were identified they were presumed to contain asbestos unless they could be sampled from an accessible edge of the roof. These situations, as well as other special situations, are discussed in the SAP located in Appendix A of this volume.

On-site inspection and assessments were conducted by John Willard, Kenneth Reynolds, and John Veitch, EPA and State of Hawai'i accredited Asbestos Inspectors. Quality control review was conducted by Dr. David M. Heisler (Principal Investigator).

# 2 Applicable Documents

The following are the regulations, standards, and other documents applicable to the survey:

**U.S. Army Publications**

| | |
|---|---|
| AR 200-1 | Environmental Protection and Enhancement |
| AR 385-40 | Accident Reporting and Records |
| EM 385-1-1 | USACE, Safety and Health Requirements Manual, 3 Sep 96 |
| AR-420-70 | Building and Structures |
| TB 420-70-8 | Asbestos Survey and Abatement |

**Title 29 Code of Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration Standards**

| | |
|---|---|
| Part 1910.20 | Access to Employee Exposure and Medical Records |
| Part 1910.95 | Occupational Noise Exposure |
| Part 1910.134 | Respiratory Protection |
| Part 1910.1000 | Air Contaminants — Permissible Exposure Limits |
| Part 1910.1001 | Asbestos |
| Part 1910.1200 | Hazard Communication |
| Part 1926.59 | Hazard Communication Construction |
| Part 1926.1101 | Asbestos in Construction |

**Title 40 Code of Federal Regulations, Environmental Protection Agency Standards**

| | |
|---|---|
| Part 61 Subpart A | National Emission Standards for Hazardous Air Pollutants |
| Part 763 | Asbestos Hazard Emergency Response Act |

**American National Standards Institute Standards**

| | |
|---|---|
| Z9.2-1979 | Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| Z88.20-1988 | Practices for Respiratory Protection |

**U.S. Environmental Protection Agency Guidelines**

| | |
|---|---|
| EPA/600/R-93/116 | Method of the Determination of Asbestos in Bulk Building Materials |
| EPA/5605-85-024 | Guidance for Controlling Asbestos Containing Building Materials |

**Underwriters Laboratories, Inc. Publications**

| | |
|---|---|
| 586-77 (R-1982) | Test Performance of High Efficiency Particulate Air Filter Units |

**State of Hawai'i Occupational Safety and Health Standards**

| | |
|---|---|
| HIOSH 12-145 | Asbestos in Construction |

**Hawai'i Administrative Rules**

| | |
|---|---|
| Chapter 11-501 | Asbestos Requirements |
| Chapter 11-502 | Asbestos Containing Materials in Schools |
| Chapter 11-503 | Fees for Asbestos Removal and Certification |
| Chapter 11-504 | Asbestos Abatement Certification Program |

**USAED, Honolulu Contractual Documents**

| | |
|---|---|
| Contract DACA83-01-D-0017 | Indefinite-Delivery Indefinite-Quantity (IDIQ) Services Contract for Asbestos/Lead Survey and Abatement Services for Honolulu Engineer District (HED) Area of Responsibility, 14 September 2001 |
| Contract DACA83-01-D-0017<br>Task Order 0001<br>Scope of Work | Asbestos Survey for Various Buildings at Pohakuloa Training Area, Wheeler Army Airfield, Fort Shafter, Tripler Army Medical Center, Waianae Recreational Center, Pohakuloa Training Area and Kiluea Military Reservation, Hawaii |

**Previous Asbestos Surveys**

*Asbestos Survey and Management Plan Report for Building 357 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter

*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii

# 3 Findings

Fifty-five homogeneous materials suspected of potentially containing asbestos were identified and sampled by SaLUT. SaLUT also identified, but did not sample, an additional eight types of floor tile and mastic that were found to be ACBM by Baker. SaLUT collected 160 bulk asbestos samples that were analyzed by White Environmental Consultants, Inc. and Globeteck at their National Voluntary Laboratory Accreditation Program (NVLAP) - accredited laboratories in Honolulu using polarized light microscopy/dispersion staining (PLM/DS) techniques. For some homogeneous materials, the laboratories used a *stop on positive* procedures whereby if one sample was confirmed as ACBM, the remaining samples were not analyzed. Composite samples of floor tile and floor tile mastic were split and the two components were analyzed individually as required by AHERA regulations. Therefore, the number of samples collected differs from the number analyzed. SaLUT submitted duplicates of 15 of the samples analyzed by White to Globeteck, and one sample analyzed by Globeteck to White, for quality control analysis. Two floor tile samples that were analyzed by White to be non-asbestos-containing (B15 and B46) were found by Globeteck to be ACBM. Three samples of caulking that were analyzed by PLM as being non-asbestos-containing were found to be ACBM when reanalyzed by transmission electron microscopy (TEM) by EMSL, Inc., a third NVLAP-accredited laboratory.

As a result of these laboratory analyses, 13 homogeneous materials (two types of floor tile, 10 types of floor tile mastic, and caulking) were confirmed as ACBM by sample analysis, in addition to the 8 types of asbestos-containing floor tile and floor tile mastic identified by Baker and remaining in the building. The condition of the encountered positive materials was good, although some floor tiles are broken. Photographs 4 through 12 illustrate the ACBMs sampled by SaLUT. SaLUT was unable to photograph the ACBMs identified by Baker because they located below underneath floor tile sampled by SaLUT and were only revealed in the small areas where SaLUT's samples were taken.

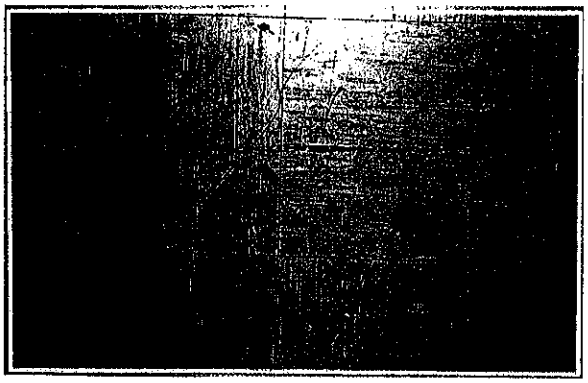
Baker indicated that plaster on the exteriors of various floors of three Quad C buildings was ACBM. Anecdotal evidence from various sources mentions occasional plaster samples from the exteriors of Quad buildings that were ACBM. However, As was the case for SaLUT's plaster samples, all of Baker's plaster samples (including interior plaster) from Quad C contained either no asbestos or less than 1 percent asbestos. Therefore, under AHERA and SaLUT's SAP, none of the plaster is ACBM.

All identified homogeneous materials considered to be potentially asbestos containing ("suspect") are listed on the *Homogeneous Materials Listing* (Table 1). These materials are grouped according to class (i.e., miscellaneous, surfacing, and thermal system insulation) and floor of the building. For each suspect material, the friability, general locations in the building, and sample numbers are indicated, as well as whether the material was determined to be ACBM or not. Red sample numbers indicate those samples that contained asbestos. Gray sample numbers indicate samples that were not analyzed because another sample of the same material contained asbestos. Suspect materials identified as ACBM by quality control analysis are identified by an asterisk (*) following the appropriate sample number. The ACBMs identified by Baker and not sampled by SaLUT are listed following SaLUT's homogeneous materials.

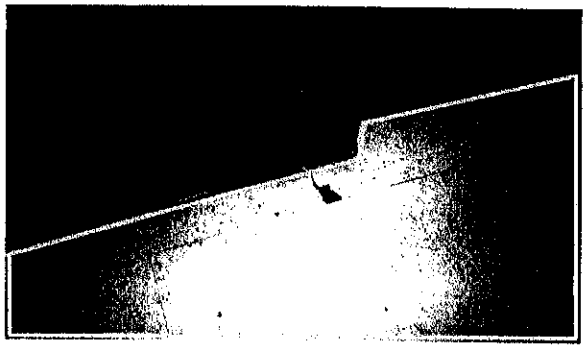
Sample collection sites for identified suspect ACBMs, as well as locations of identified ACBMs, are indicated on the building drawings (Figure 1).

Table 2, *Summary of Asbestos-Containing Materials,* provides a summary of the encountered ACBMs in the building. Each material is listed with information regarding the type, location, and condition of the ACBM, along with the recommended response action for the material.

Laboratory analysis sheets for all samples collected by SaLUT, including the quality control analyses, are located at the end of this report. The TEM analysis results are located at the end of the laboratory results.

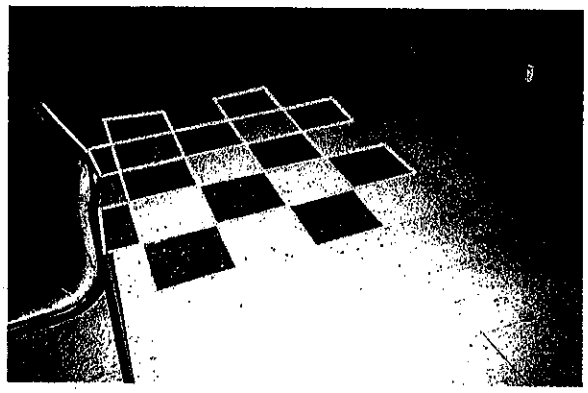


*Photograph 4. FT2. This floor tile (FT2) contains asbestos. The mastic below it (FM2) does not.*

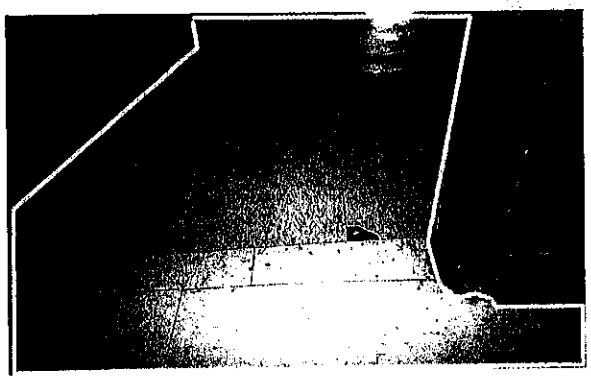


*Photograph 5. FM3, FM7, FM14. The mastics (FM3, FM7, and FM14) below this floor tile (FT3 on the Third Floor, FT7 on the Second Floor, and FT14 on the First Floor) all contain asbestos. The floor tiles do not.*

*Photograph 6. FM5. The mastic (FM5) below this floor tile (FT5) contains asbestos. The floor tile does not.*

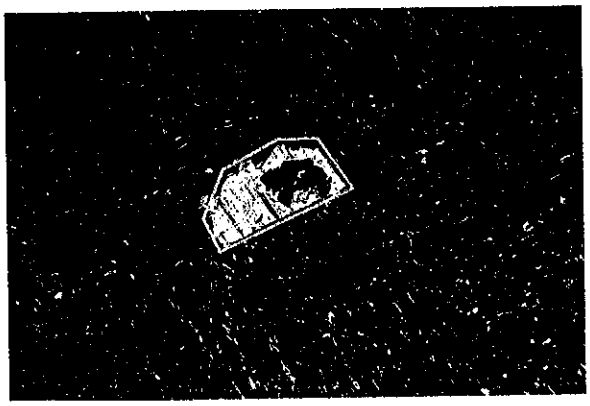


*Photograph 7. FM4. The mastic (FM4) below this floor tile (FT4) contains asbestos. The floor tile does not.*



*Photograph 8. FM6. The mastic (FM6) below this floor tile (FT6) contains asbestos. The floor tile does not.*

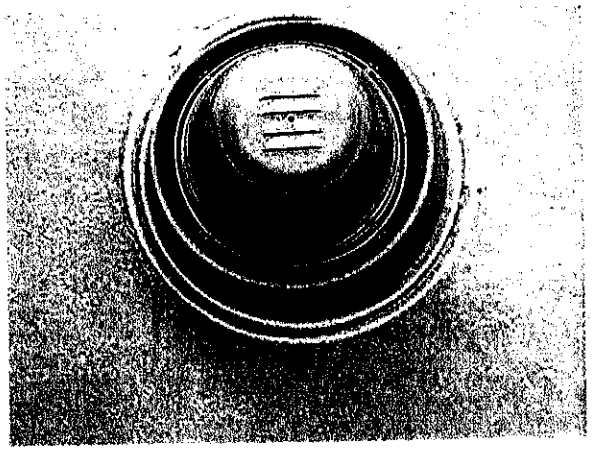
*Photograph 9. FT10 and FM10. This floor tile (FT10) and the mastic below it (FM10) both contain asbestos.*



*Photograph 10. FM11. The mastic (FM11) below this floor tile (FT11) contains asbestos. The floor tile does not.*

*Photograph 11. FM13. The mastic (FM13) below this floor tile (FT13) contains asbestos. The floor tile does not.*

*Photograph 12. FM15. This mastic (FM15) below this floor tile (FT15) contains asbestos. The floor tile does not.*



*Photograph 13. CK1. This caulking on the exterior of the building is sealant at the base of this exhaust vent from the Cafeteria.*

**Table 1. Homogeneous Materials Listing. Descriptions of asbestos-containing materials from Baker's survey are taken from Baker's report.**

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM ? | Est. Quantity |
| First Floor | | | | | | |
| AD1 | White adhesive | No | Below carpet in Rooms 144, 155 | B1, B17, B18 | No | |
| BM1 | White vinyl baseboard mastic | No | Rooms 130, 131, 146 | B2, B134, B136 | No | |
| CT1 | 2′ x 4′ white ceiling tile | Yes | Many First Floor rooms | B3, B88, B97, B98, B120, B126, B127, B128, B129, B130, B131, B132 | No | |
| FM1 | Dark yellow mastic | No | Below FT1 | B6, B8, B10 | No | |
| FM2 | Brown/dark yellow mastic | No | Below FT2 | B12, B14, B16 | No | |
| FM11 | Black mastic | No | Below FT11 | B84, B85, B86 | Yes | 4,320 sf |
| FM 12 | Yellow mastic | No | Below FT12 | B91, B92, B94 | No | |
| FM14 | Black/yellow mastic | No | Below FT14 | B121, B122, B133 | Yes | 1,634 sf |
| FM15 | Black/yellow mastic | No | Below FT15 | B123, B124, B125 | Yes | 151 sf |
| FT1 | 12″ x 12″ blue floor tile with white specks | No | Rooms 106, 108, 115, 116, 118, 122, 134, 144 | B5, B7, B9 | No | |
| FT2 | 12″ x 12″ cream floor tile with brown streaks | No | Rooms 106-108, 115-118, 125, 143, 144 | B11, B13, B15* | Yes | 5,728 sf |
| FT11 | 12″x 12″ brown floor tile with brown streaks | No | Rooms 105, 115, 116, 118, 120, 125; hallway outside Room 120A | B84, B85, B86 | No | |
| FT12 | 12″x 12″ reddish brown floor tile with white streaks | No | Rooms 107, 108 | B91, B92, B94 | No | |
| FT14 | 12″x 12″ white floor tile with gray and brown specks | No | Rooms 122, 127-130, 132, 133 | B121, B122, B133 | No | |
| FT15 | 12″ x 12″ tan floor tile with brown and white streaks | No | Room 125 | B123, B124, B125 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M038 | 12 x 12 floor tile cream | No | Rooms 134, 141, 146-152, 154 | See Baker's report | Yes | 1,643 sf |
| M039 | Flooring adhesive black | No | Below M038 | See Baker's report | Yes | 1,643 sf |
| M043 | 12 x 12 floor tile olive | No | Rooms 126, 130, 135, 145, 153, 155 | See Baker's report | Yes | 1,253 sf |
| M044 | Flooring adhesive black | No | Below M043 | See Baker's report | Yes | 1,253 sf |
| M049 | 12 x 12 floor tile rust | No | Room 143 | See Baker's report | Yes | 798 sf |
| M050 | Flooring adhesive black | No | Below M049 | See Baker's report | Yes | 798 sf |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM ? | Est. Quantity |
| M059 | 12 x 12 floor tile dark beige | No | Rooms 122, 131 | See Baker's report | Yes | 6 sf |
| M060 | Flooring adhesive black | No | Below M060 | See Baker's report | Yes | 6 sf |
| | | | Second Floor | | | |
| AD2 | Off-white adhesive | No | Behind wall carpet | B47, B104, B105 | No | |
| BM3 | Tan/cream vinyl baseboard mastic | No | Rooms 227, 245, 266 | B43, B51, B102 | No | |
| CT2 | 2′ x 4′ white ceiling tile | Yes | Rooms 211-213, 231, 247, 274 | B34, B39, B40, B49, B116, B117, B118, B141, B142 | No | |
| DW1 | Sheetrock | Yes | Numerous rooms | B149, B150, B151 | No | |
| FM7 | Black/yellow/brown mastic | No | Below FT7 | B36, B37, B38, B48 | Yes | 13,923 sf |
| FM10 | Black mastic | No | Below FT10 | B44, B45, B46 | Yes | 48 sf |
| FT7 | 12″ x 12″ white floor tile with gray and brown specks | No | All rooms and hallways except Rooms 218, 221, 256, 259, 261 | B35, B37, B38, B48 | No | |
| FT10 | 12″ x 12″ olive floor tile (painted black) | No | Room 259 | B44, B45, B46* | Yes | 48 sf |
| SK1 | Sink undercoating | No | Rooms 221, 256, 261 | B52, B53, B103 | No | |
| VJ1 | Air conditioning vibration dampener | No | Rooms 222, 230, 249 | B41, B99, B101 | No | |
| | | | Third Floor | | | |
| AD3 | White/off-white adhesive | No | Behind wall carpet in rooms 345, 357, 387 | B67, B68, B69 | No | |
| BM2 | Tan/white/gray vinyl baseboard mastic | No | Rooms 320, 343, 365 | B22, B59, B63 | No | |
| BM4 | Dark brown vinyl baseboard mastic | No | Rooms 342, 387, 357 | B64, B65, B66 | No | |
| CT3 | 2′ x 4′ white ceiling tile | Yes | Rooms 300, 310, 371 | B58, B61, B114 | No | |
| DW2 | Sheetrock | Yes | Numerous rooms | B155, B156, B157 | No | |
| FM3 | Black/amber mastic | No | Below FT3 | B20, B21, B54, B55, B56, B57, B106 | Yes | 16,023 sf |
| FM4 | Black/brown mastic | No | Below FT4 | B24, B25, B27, B29 | Yes | 4 sf |
| FM5 | Black mastic | No | Below FT5 | B30, B31, B111, B112 | Yes | 184 sf |
| FM6 | Black mastic | No | Below FT6 | B33, B107 | Yes | 640 sf |
| FM13 | Black mastic | No | Below FT13 | B108, B109, B110 | Yes | 184 sf |
| FT3 | 12″ x 12″ white floor tile with gray and brown specks | No | All rooms and hallways except 318, 321, 356, 361-363, 367, 369 | B20, B54, B106, B55, B56, B57 | No | |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM ? | Est. Quantity |
| FT4 | 12″ x 12″ blue floor tile with white specks | No | Room 369 | B24, B26, B28 | No | |
| FT5 | 12″ x 12″ cream floor tile with brown streaks | No | Room 369 | B30, B111, B112 | No | |
| FT6 | 12″ x 12″ beige floor tile with dark spots | No | Rooms 362, 363 | B32, B107 | No | |
| FT13 | 12″x 12″ brown floor tile with light brown spots | No | Room 367 | B108, B109, B110 | No | |
| SK2 | Sink undercoating | No | Rooms 318, 321, 358 | B70, B71, B72 | No | |
| VJ2 | Air conditioning vibration dampener | No | Rooms 300, 371, 380 | B62, B113, B115 | No | |
| Roof | | | | | | |
| CK1 | Caulking | No | Exterior; off fan outlets; first floor; dining hall vents | B77, B78, B79 | Yes | 10 lf |
| TR1 | Lath and plaster | No | Exterior (west and east); first floor above windows; row 109; room 138; outside room 150 | B76, B80, B149 | No | |
| VJ3 | Vibration dampener | No | Exterior (north); first floor fan outlets; dining hall vents | B73, B74, B75 | No | |

| Surfacing Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| PL2 | Plaster on support columns, beams, and ceilings | No | Numerous rooms | B87, B89, B90 | No | |
| PL3 | Ceiling plaster | No | Rooms 108, 111, 113 | B93, B95, B96 | | |
| WB2 | Wall plaster | Yes | Rooms 125, 131, 140 | B135, B139, B140 | No | |
| Second Floor | | | | | | |
| PL5 | Plaster coating on permanent building structure | No | Hallways of rooms 227, 244, and 266 | B146, B147, B148 | No | |
| PL6 | Wall plaster | No | Exterior | B152, B153, B154 | No | |
| Third Floor | | | | | | |
| PL4 | Plaster coating on permanent building structure | No | Hallways of rooms 305, 306, 366 | B143, B144, B145 | No | |
| PL7 | Wall plaster | No | Exterior | B158, B159, B160 | No | |

| Surfacing Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| Roof and Exterior | | | | | | |
| PL1 | Plaster coating on building structure | No | Exterior: east (room 142), north (room 138), west, (room 120); first floor | B81, B82, B83 | No | |

| Thermal System Insulation Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| DI1 | Air conditioning duct insulation | No | Rooms 140, 153 | B4, B137, B138 | No | |
| Second Floor | | | | | | |
| DI3 | Air conditioning duct insulation | No | Rooms 222, 249, 272 | B42, B50, B100 | No | |
| Third Floor | | | | | | |
| DI2 | Air conditioning duct insulation | No | Rooms 300, 377, 381 | B19, B23, B60 | No | |
| Roof | | | | | | |
| None | | | | | | |

(*) Denotes a material confirmed as asbestos containing by QC sample analysis.

# FIGURE 1

# BUILDING DRAWING LEGEND

| ASBESTOS CONTAINING MATERIALS AND QUANTITIES | | |
|---|---|---|
| CK | Caulking | CK • |
| FT/ FM | Floor Tile and/or Mastic | |

| ACCESSIBILITY | |
|---|---|
| NAC | NO ACCESS ABOVE CEILING |
| NA | NO ACCESS TO THIS SPACE |
| LCA | LIMITED ACCESS BENEATH CARPET |

| SYMBOLS | |
|---|---|
| 100 | SPACE NUMBER |
| B25 | POSITIVE BULK SAMPLE LOCATION |
| B35 | NEGATIVE BULK SAMPLE LOCATION |
| B45 | NOT ANALYZED BULK SAMPLE LOCATION |

FIGURE 2: BUIDLING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 357
FIRST FLOOR

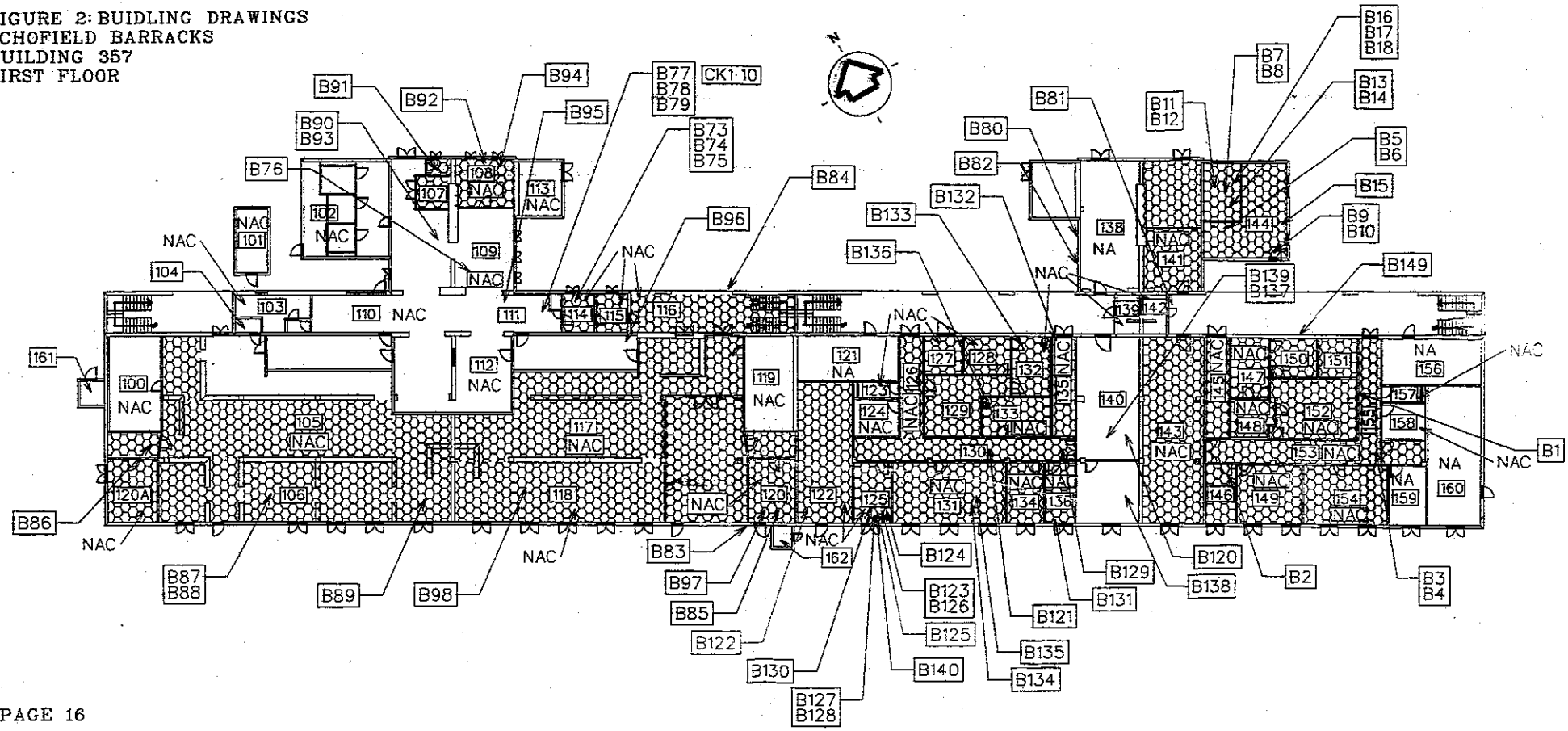


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 357
SECOND FLOOR

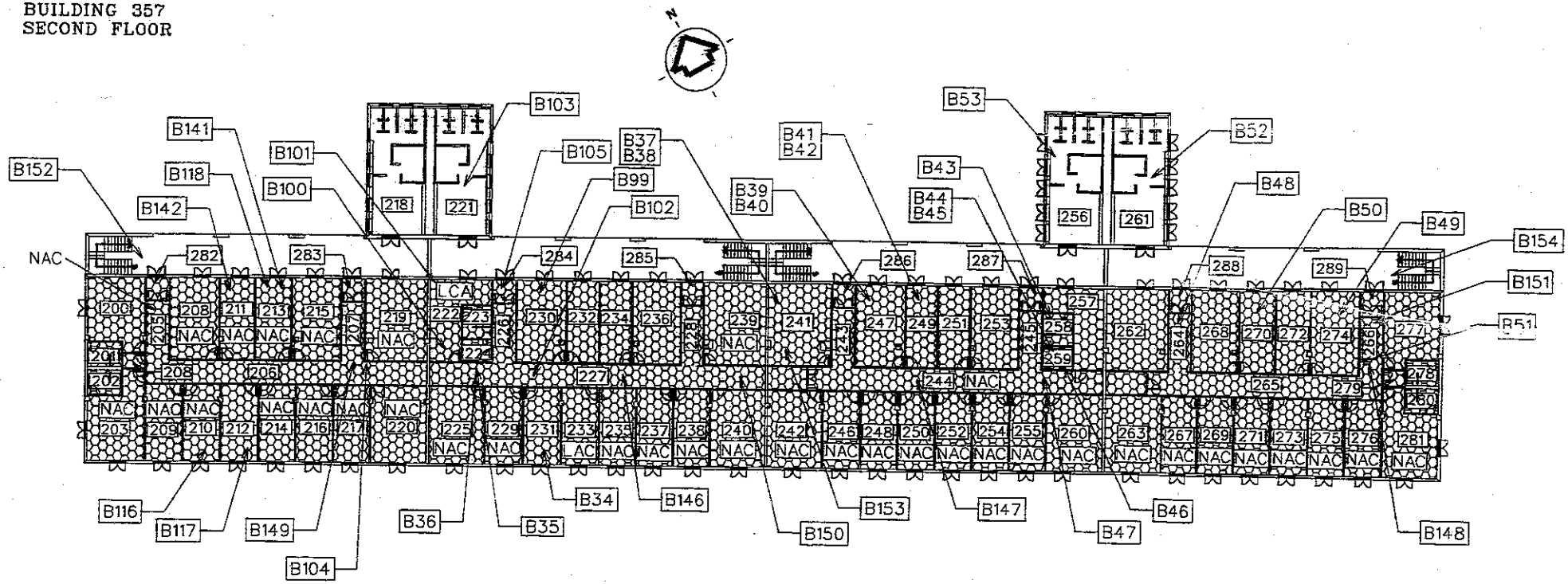
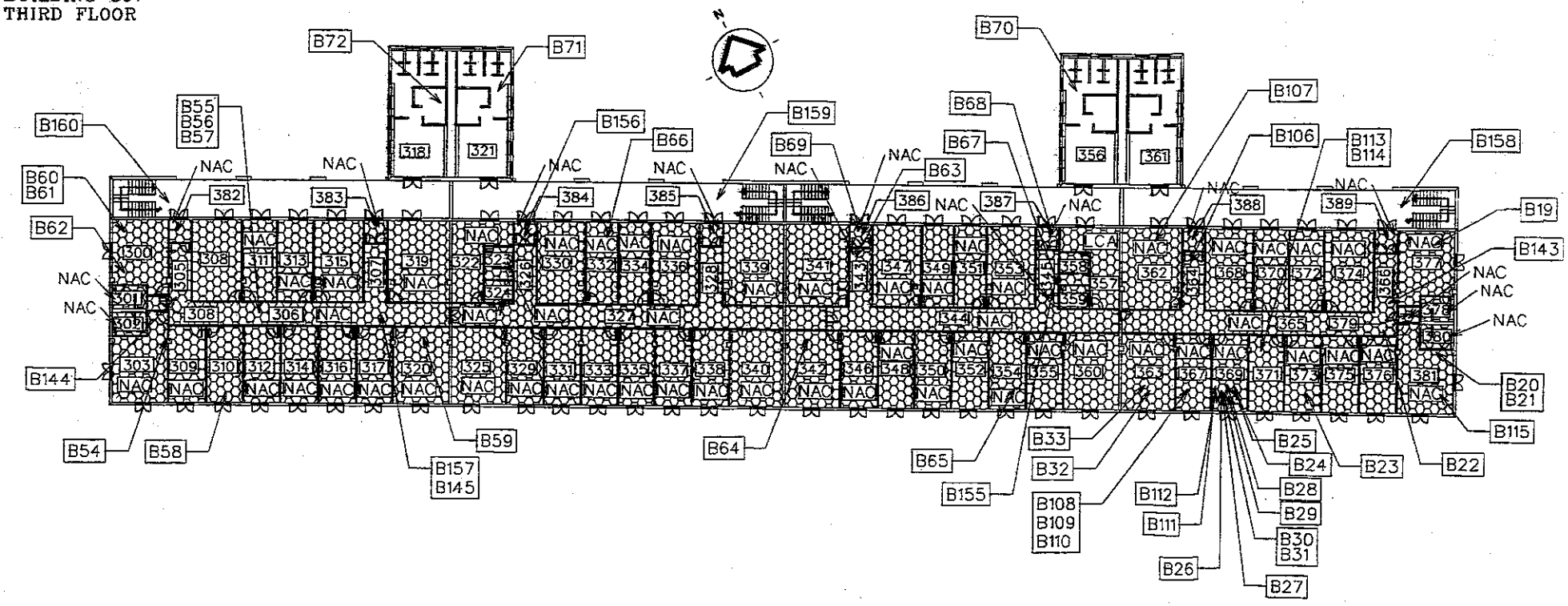


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 357
THIRD FLOOR



# 4 Recommendations

Each friable ACBM was assessed and placed in the appropriate AHERA category as specified in 40 CFR, Part 763.88. In addition to the seven AHERA assessment categories, SaLUT added an eighth category for all non-friable ACBM.

SaLUT also categorized the condition of each ACBM at the time of the survey, as follows:

**Good** No damage observed

**Fair** The area of distributed damage was less than 10 percent and greater than 2 percent. The area of localized damage was less than 25 percent and greater than 2 percent.

**Poor** The area of distributed damage was greater than 10 percent and the localized damage was greater than 25 percent.

Based on the AHERA assessment category and SaLUT's condition assessment, SaLUT recommends on or more of the following response actions for each ACBM:

**O&M** Maintain the ACBM. Perform operations and maintenance procedures in a manner that does not damage the material. These procedures are specified in 29 CFR 1926.1101 and HAR 11-502-10. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

**Repair** Damaged areas should be repaired. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

Undamaged and repaired materials are subject to the O&M response action.

**Remove** The material should be removed. Removal must be performed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

If the building is demolished or renovation will impact any ACBMs, those materials must be removed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

Table 2 provides the AHERA assessment category, SaLUT's condition assessment, and SaLUT's recommended response action for each ACBM.

**Table 2. Summary of Asbestos-Containing Materials.**

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| **First Floor** | | | | | | | |
| FM11 Black mastic | Rooms 105, 115, 116, 118, 120, 125; hallway outside Room 120A | 4,320 sf | No | Good | 8 | O&M | 10 |
| FM14 Black mastic | Rooms 122, 128-130, 132, 133 | 2,134 sf | No | Good | 8 | O&M | 5 |
| FM15 Black mastic | Room 125 | 151 sf | No | Good | 8 | O&M | 12 |
| FT2 12" x 12" cream floor tile with brown streaks | Rooms 106-108, 115-118, 125, 143, 144 | 5,728 sf | No | Good | 8 | O&M | 4 |
| M038 12 x 12 floor tile cream | Rooms 134, 141, 146-152, 154 | 1,643 sf | No | Good | 8 | O&M | None |
| M039 Flooring adhesive black | Below M038 | 1,643 sf | No | Good | 8 | O&M | None |
| M043 12 x 12 floor tile olive | Rooms 126, 130, 135, 145, 153, 155 | 1,253 sf | No | Good | 8 | O&M | None |
| M044 Flooring adhesive black | Below M043 | 1,253 sf | No | Good | 8 | O&M | None |
| M049 12 x 12 floor tile rust | Room 143 | 798 sf | No | Good | 8 | O&M | None |
| M050 Flooring adhesive black | Below M049 | 798 sf | No | Good | 8 | O&M | None |
| M059 12 x 12 floor tile dark beige | Rooms 122, 131 | 6 sf | No | Good | 8 | O&M | None |
| M060 Flooring adhesive black | Below M059 | 6 sf | No | Good | 8 | O&M | None |
| **Second Floor** | | | | | | | |
| FM7 Black mastic | Below FT7 (all rooms and hallways except Rooms 218, 221, 256, 259, 261) | 13,923 sf | No | Good | 8 | O&M | 5 |
| FM10 Black mastic | Room 259 | 48 sf | No | Good | 8 | O&M | 9 |
| FT10 12"x12" olive floor tile (painted black) | Room 259 | 48 sf | No | Good | 8 | O&M | 9 |
| **Third Floor** | | | | | | | |
| FM3 Black/amber mastic | Below FT3 (all rooms and hallways except 318, 321, 356, 361-363, 367, 369) | 16,023 sf | No | Good | 8 | O&M | 5 |
| FM4 Black/brown mastic | Room 369 | 4 sf | No | Good | 8 | O&M | 7 |
| FM5 Black mastic | Room 369 | 184 sf | No | Good | 8 | O&M | 6 |
| FM6 Black mastic | Rooms 362, 363 | 640 sf | No | Good | 8 | O&M | 8 |
| FM13 Black mastic | Room 367 | 184 sf | No | Good | 8 | O&M | 11 |
| **Roof** | | | | | | | |
| CK1 Caulking | Exterior; off fan outlets; first floor; dining hall vents | 10 lf | No | Good | 8 | O&M | 13 |

Table 3 provides SaLUT's cost estimate for abating (i.e., removing) each ACBM identified in the building. These estimates are conceptual cost estimates based on standard unit rates for different types of ACBM except for very small abatement projects, where the minimum cost is $1,200. Contractor mobilization/demobilization, transportation, disposal, and other miscellaneous costs are included in the unit. Operations and maintenance (O&M) costs are not provided as part of the recommended response cost.

**Table 3. Asbestos Abatement Cost Estimates.**

| Material Type | | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|---|
| | | First Floor | | | |
| FM11 | Black mastic | Rooms 105, 115, 116, 118, 120, 125; hallway outside Room 120A | 4,320 sf | 3 | $12,960 |
| FM14 | Black mastic | Rooms 122, 128-130, 132, 133 | 2,134 sf | 3 | 6,402 |
| FM15 | Black mastic | Room 125 | 151 sf | 3 | 453 |
| FT2 | 12" x 12" cream floor tile with brown streaks | Rooms 106-108, 115-118, 125, 143, 144 | 5,728 sf | 5 | 28,640 |
| M038 | 12 x 12 floor tile cream | Rooms 134, 141, 146-152, 154 | 1,643 sf | 5 | 8,215 |
| M039 | Flooring adhesive black | Below M038 | 1,643 sf | 3 | 4,929 |
| M043 | 12 x 12 floor tile olive | Rooms 126, 130, 135, 145, 153, 155 | 1,253 sf | 5 | 6,265 |
| M044 | Flooring adhesive black | Below M043 | 1,253 sf | 3 | 3,759 |
| M049 | 12 x 12 floor tile rust | Room 143 | 798 sf | 5 | 3,990 |
| M050 | Flooring adhesive black | Below M049 | 798 sf | 3 | 2,394 |
| M059 | 12 x 12 floor tile dark beige | Rooms 122, 131 | 6 sf | 5 | 30 |
| M060 | Flooring adhesive black | Below M059 | 6 sf | 3 | 18 |
| | | Second Floor | | | |
| FM7 | Black mastic | Below FT7 (all rooms and hallways except Rooms 218, 221, 256, 259, 261) | 13,923 sf | 3 | 41,769 |
| FM10 | Black mastic | Room 259 | 48 sf | 3 | 144 |
| FT10 | 12"x12" olive floor tile (painted black) | Room 259 | 48 sf | 5 | 240 |
| | | Third Floor | | | |
| FM3 | Black/amber mastic | Below FT3 (all rooms and hallways except 318, 321, 356, 361-363, 367, 369) | 470 sf | 3 | 1,410 |
| FM4 | Black/brown mastic | Room 369 | 3,425 sf | 3 | 10,275 |
| FM5 | Black mastic | Room 369 | 697 sf | 3 | 2,091 |
| FM6 | Black mastic | Rooms 362, 363 | 697 sf | 3 | 2,091 |
| FM13 | Black mastic | Room 367 | 2,728 sf | 3 | 8,184 |
| | | Roof | | | |
| CK1 | Caulking | Exterior; off fan outlets; first floor; dining hall vents | 10 lf | 3 | 30 |
| Total abatement cost | | | | | $144,289 |

**Analytical Laboratory Sample Results**
**And**
**Chains of Custody**

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10271
**Report Date:** 12/6/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 36 **# Layers:** 37

**Collected Date:** 11/30/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** G. Slaugenhou
**Analysis Date:** 12/5/01
**Received By:** S.Santos
**Received Date:** 12/3/01

**Project Name/Location:** Quad C - Bldg. 357 Schofield Barracks

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B1 | HB01-3305 | Room 155 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Brown/Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B2 | HB01-3306 | Room 146 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Brown/Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:*** ***100%***

**Sample Comments:**

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B3 | HB01-3307 | Room 153 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *60%*

*% Non Fiberous Materials:* *40%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B4 | HB01-3308 | Room 153 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Insulation Jacket | Silver/Red |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Synthetic | 15% |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *15%*

*% Non Fiberous Materials:* *85%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B5 | HB01-3309 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments: No mastic recovered.

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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B6 | HB01-3310 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |
| Wollastonite | 2% |

*% Other Fiberous Materials:* *3%*

**% Non Fiberous Materials:** **97%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B7 | HB01-3311 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials:** **100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B8 | HB01-3312 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Drk. Yellow |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fiberous Materials:* *2%*

**% Non Fiberous Materials:** **98%**

Sample Comments:

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
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(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B9 | HB01-3313 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: 0%*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B10 | HB01-3314 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Drk. Yellow |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: 0%*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B11 | HB01-3315 | Room 144 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: Trace*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B12 | HB01-3316 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Drk. Yellow |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials: 99%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B13 | HB01-3317 | Room 144 | 1 of 1 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan/Brown |

*% Asbestos:* *Trace*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials: 100%**

Sample Comments:

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| Client ID# | WEC ID#. | Location | Layer |
|---|---|---|---|
| 357-B14 | HB01-3318 | Room 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brwn/Yellow |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fiberous Materials:* *2%*

**% Non Fiberous Materials: 98%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10271
**Report Date:** 12/6/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B15 | HB01-3319 | Room 144 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *Trace*

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B16 | HB01-3320 | Room 144 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Brwn. |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *2%*

***% Non Fiberous Materials:*** ***98%***

**Sample Comments:**

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B17 | HB01-3321 | Room 144 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Gray |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:*** ***100%***

**Sample Comments:**

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(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10271
**Report Date:** 12/6/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B18 | HB01-3322 | Room 144 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Gray |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B19 | HB01-3323 | Room 377 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Insulation Jacket | Red/Silver |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Synthetic | 15% |

*% Other Fiberous Materials:* *15%*

***% Non Fiberous Materials:* *85%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B20 | HB01-3324-A | Room 381 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10271
**Report Date:** 12/6/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B20 | HB01-3324-B | Room 381 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *5%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *95%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B21 | HB01-3325 | Room 381 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *15%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *85%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B22 | HB01-3326 | Room 365 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |
| Synthetic | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Tan/Gray |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B23 | HB01-3327 | Room 381 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation Jacket | Silv/Orange |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 10% |

*% Other Fiberous Materials:* *10%*

*% Non Fiberous Materials:* *90%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B24 | HB01-3328 | Room 369 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B25 | HB01-3329 | Room 369 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos:* *5%*

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *94%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B26 | HB01-3330 | Room 369 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B27 | HB01-3331 | Room 369 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *15%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *85%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B28 | HB01-3332 | Room 369 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Blue/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B29 | HB01-3333 | Room 369 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos: 3%*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 96%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B30 | HB01-3334 | Room 369 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Asbestos**

None Detected

**Other Fiberous Materials**

None Detected

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B31 | HB01-3335 | Room 369 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 8% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 8%*

*% Other Fiberous Materials: 2%*

*% Non Fiberous Materials: 90%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10271
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B32 | HB01-3336 | Room 363 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%

*% Other Fiberous Materials:* Trace

**% Non Fiberous Materials:** 100%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B33 | HB01-3337 | Room 363 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* 15%

*% Other Fiberous Materials:* 3%

**% Non Fiberous Materials:** 82%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B34 | HB01-3338 | Room 231 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Asbestos:* 0%

*% Other Fiberous Materials:* 60%

**% Non Fiberous Materials:** 40%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10271
**Report Date:** 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B35 | HB01-3339 | Room 227 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

***% Non Fiberous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B36 | HB01-3340 | Room 227 | 1 of 1 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

*% Asbestos:* *10%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fiberous Materials:* *2%*

***% Non Fiberous Materials:*** ***88%***

**Sample Comments:**

Comments:

**Analyst** _____ **Date** 12-06-01
**QC** _____ **Date** 12-06-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-075
**Client Project#:** 01-290

**Report #:** 11123
**Report Date:** 1/23/02

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 1 **# Layers:** 1

**Collected Date:** 1/23/02
**Collected By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/23/02
**Received By:** Hamasaki, R.
**Received Date:** 1/23/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-357-KWR-B149 | HB02-0299 | Ext. Of Room 150 Above Window | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

**Sample Comments:**

Comments:

**Analyst** Sam Wells **Date** 1/23/02
**QC** [signature] **Date** 1/23/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10327
**Report Date:** 12/9/2001

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 11 **# Layers:** 16

**Collection Date:** 12/3/2001
**Collection By:** Client
**TAT:** 3 Business Days
**Analysis By:** G. Slaugenhou
**Analysis Date:** 12/9/2001
**Received By:** Santos, K.
**Received Date:** 12/5/2001

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357
**Building:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B37 | HB01-3400-A | Room 241 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B37 | HB01-3400-B | Room 241 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 10% |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

***% Asbestos:*** ***10%***

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***88%***

**Sample Comments:**

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FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10327
**Report Date:** 12/9/2001

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B38 | HB01-3401-A | Room 241 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | VC Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B38 | HB01-3401-B | Room 241 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *94%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B39 | HB01-3402 | Room 247 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *40%*

*% Other Fibrous Materials:* *15%*

*% Non Fibrous Materials:* *60%*

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10327
Report Date: 12/9/2001

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B40 | HB01-3403 | Room 247 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Other Fibrous Materials:* 35%

*% Other Fibrous Materials:* 25%

**% Non Fibrous Materials:** 65%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B41 | HB01-3404 | Room 249 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Fabric | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Synthetic | 85% |

*% Other Fibrous Materials:* 85%

**% Non Fibrous Materials:** 15%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B42 | HB01-3405 | Room 249 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation Jacket | Silver/Orange |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 50% |
| Synthetic | 5% |

*% Other Fibrous Materials:* 50%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 50%

Sample Comments:

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10327
**Report Date:** 12/9/2001

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B43 | HB01-3406 | Room 245 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B44 | HB01-3407-A | Room 259 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Green |

**Other Fibrous Materials**

None Detected

*% Asbestos:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B44 | HB01-3407-B | Room 259 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *15%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *83%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10327
**Report Date:** 12/9/2001

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B45 | HB01-3408-A | Room 259 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Green |

***% Asbestos: Trace***

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B45 | HB01-3408-B | Room 259 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 10% |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

***% Asbestos: 10%***

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***

***% Non Fibrous Materials: 88%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B46 | HB01-3409-A | Room 259 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Green |

***% Asbestos: Trace***

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10327
**Report Date:** 12/9/2001

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B46 | HB01-3409-B | Room 259 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 8% |

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |
| Wollastonite | *Trace* |

*% Asbestos:* 8%
*% Other Fibrous Materials:* 5%
*% Other Fibrous Materials:* *Trace*
**% Non Fibrous Materials:** 87%

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B47 | HB01-3410 | Room 244 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic,CB | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Synthetic | 3% |

*% Other Fibrous Materials:* 3%
**% Non Fibrous Materials:** 97%

**Sample Comments:**

Comments:

**Analyst** G. Slaugenhaupt **Date** 12-9-2001
**QC** [illegible] **Date** 03-07-02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10336
**Report Date:** 12/10/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 15 **# Layers:** 22

**Collected Date:** 12/6/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/10/01
**Received By:** Santos, K.
**Received Date:** 12/7/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B48 | HB01-3480-A | Room 264 2nd Floor | 1 of 2 |

**Asbestos**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

None Detected

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B48 | HB01-3480-B | Room 264 2nd Floor | 2 of 2 |

**Asbestos**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

None Detected

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

***% Other Fibrous Materials: 4%***

***% Non Fibrous Materials: 96%***

**Sample Comments:** Insufficient amount of mastic on tile to analyze for accurate results.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10336
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B49 | HB01-3481 | Room 274 2nd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *80%*

*% Non Fibrous Materials:* *20%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B50 | HB01-3482-A | Room 270 2nd Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Rust |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 3% |
| Cellulose | 10% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *13%*

*% Non Fibrous Materials:* *87%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B50 | HB01-3482-B | Room 270 2nd Floor | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Rust |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 97% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *97%*

*% Non Fibrous Materials:* *3%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10336
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B51 | HB01-3483 | Room 266 2nd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Cream |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

**% Non Fibrous Materials: 96%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B52 | HB01-3484 | Room 261 2nd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B53 | HB01-3485 | Room 256 2nd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10336
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B54 | HB01-3486-A | Room 303 3rd Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

**% Non Fibrous Materials:** 100%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B54 | HB01-3486-B | Room 303 3rd Floor | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 7% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 7%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 91%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B55 | HB01-3487-A | Room 306 3rd Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

**% Non Fibrous Materials:** 100%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10336
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B55 | HB01-3487-B | Room 306 3rd Floor | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 7% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Amber |

*% Asbestos:* 7%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 91%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B56 | HB01-3488-A | Room 306 3rd Floor | 1 of 2 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Begie |

*% Asbestos:* 0%

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials:** 100%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B56 | HB01-3488-B | Room 306 3rd Floor | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 94%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10336
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B57 | HB01-3489-A | Room 306 3rd Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Cream |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B57 | HB01-3489-B | Room 306 3rd Floor | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Amber |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 6%*

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 92%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B58 | HB01-3490 | Room 310 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 55% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 75%*

*% Non Fibrous Materials: 25%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10336
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B59 | HB01-3491 | Room 320 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:*** ***97%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B60 | HB01-3492-A | Room 300 3rd Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 2% |
| Cellulose | 10% |

*% Other Fibrous Materials:* *12%*

***% Non Fibrous Materials:*** ***88%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B60 | HB01-3492-B | Room 300 3rd Floor | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 97% |

*% Other Fibrous Materials:* *97%*

***% Non Fibrous Materials:*** ***3%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10336
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B61 | HB01-3493 | Room 300 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

*% Other Fibrous Materials:* *80%*

**% Non Fibrous Materials: 20%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B62 | HB01-3494 | Room 300 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 4% |

*% Other Fibrous Materials:* *29%*

**% Non Fibrous Materials: 71%**

Sample Comments:

Comments:

Analyst [signature] Date 12/10/01
QC [signature] Date 12-10-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10349
Report Date: 12/10/01

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 10 # Layers: 10

Collected Date: 12/6/01
Collected By: Client
TAT: 3 Business Days
Analysis By: S. Wells
Analysis Date: 12/10/01
Received By: Santos, K.
Received Date: 12/7/01

Project Name/Location: Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B63 | HB01-3495 | Room 343 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos: 0%*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 99%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B64 | HB01-3496 | Room 342 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Debris | Multi-color |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | *Trace* |
| Cellulose | 25% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 25%*

*% Non Fibrous Materials: 75%*

Sample Comments: Sample was pulverized and consisted of misc. materials.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290`

Report #: 10349
Report Date: 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B65 | HB01-3497 | Room 354 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Debris | Brown/Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 20% |

*% Other Fibrous Materials:* *20%*

***% Non Fibrous Materials:* *80%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B66 | HB01-3498 | Room 332 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B67 | HB01-3499 | Room 345 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | Yes | Adhesive | White |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials:* *100%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10349
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B68 | HB01-3500 | Room 387 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Synthetic | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 98%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B69 | HB01-3501 | Room 356 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Off-White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Synthetic | 1% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

**% Non Fibrous Materials:** 99%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B70 | HB01-3502 | Room 358 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black / Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

**% Non Fibrous Materials:** 99%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290`

Report #: 10349
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B71 | HB01-3503 | Room 321 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B72 | HB01-3504 | Room 318 3rd Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

Comments:

Analyst [signature] Date 12/10/01
QC [signature] Date 12-10-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10490
Report Date: 12/17/01

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 11 # Layers: 17

Collected Date: 12/11/01
Collected By: Client
TAT: 3 Business Days
Analysis By: S. Wells
Analysis Date: 12/17/01
Received By: Santos, K.
Received Date: 12/12/01

Project Name/Location: Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B73 | HB01-3720-A | Exterior: North Fan Outlets 1st Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Covering | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 2% |

*% Asbestos:* 0%
*% Other Fibrous Materials:* 42%
*% Non Fibrous Materials:* 58%

Sample Comments: Rubber with fiberglass mesh.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B73 | HB01-3720-B | Exterior: North Fan Outlets 1st Floor | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%
*% Other Fibrous Materials:* 2%
*% Non Fibrous Materials:* 98%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10490
Report Date: 12/17/01

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Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121101-357-JMV-B74 | HB01-3721-A | Exterior: North Fan Outlets 1st Floor |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Covering | Black/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 3% |

*% Other Fibrous Materials:* *43%*

***% Non Fibrous Materials:* *57%***

**Sample Comments:** Rubber with fiberglass mesh.

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121101-357-JMV-B74 | HB01-3721-B | Exterior: North Fan Outlets 1st Floor |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | *Trace* |
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

**Sample Comments:**

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121101-357-JMV-B75 | HB01-3722-A | Exterior: North Fan Outlets 1st Floor |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Covering | Black/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 2% |

*% Other Fibrous Materials:* *47%*

***% Non Fibrous Materials:* *53%***

**Sample Comments:** Rubber with fiberglass mesh.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10490
**Report Date:** 12/17/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B75 | HB01-3722-B | Exterior: North Fan Outlets 1st Floor | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B76 | HB01-3723 | Exterior: West Above Window Room 109 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Plaster | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

**Sample Comments:** Material was received in powder form

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B77 | HB01-3724-A | Exterior: Off Fan Outlets 1st Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10490
Report Date: 12/17/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B77 | HB01-3724-B | Exterior: Off Fan Outlet 1st Floor | 2 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Caulking | White/Brown |

**Asbestos**

| Type | % |
|---|---|
| Tremolite | 1% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |
| Nemolite | 5% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *8%*

**% Non Fibrous Materials: 91%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B78 | HB01-3725-A | Exterior Off Fan Outlet 1st Floor | 1 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B78 | HB01-3725-B | Exterior: Off Fan Outlet 1st Floor | 2 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Caulking | Brown |

**Asbestos**

| Type | % |
|---|---|
| Tremolite | 1% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |
| Nemolite | 5% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *8%*

**% Non Fibrous Materials: 91%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10490
**Report Date:** 12/17/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B79 | HB01-3726-A | Exterior: Off Fan Outlet 1st Floor | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Silver Coat | Silver |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B79 | HB01-3726-B | Exterior: Off Fan Outlets 1st Floor | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Tremolite | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Caulking | White/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |
| Nemolite | 5% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *9%*

*% Non Fibrous Materials:* *90%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B80 | HB01-3727 | Exterior: East Above Window Room 138 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10490
**Report Date:** 12/17/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B81 | HB01-3728 | Exterior: East Room 142 1st Floor | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B82 | HB01-3729 | Exterior: North Room 138 1st Floor | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials;* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-357-JMV-B83 | HB01-3730 | Exterior: West Room 120 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10490
**Report Date:** 12/17/01

Comments:

**Analyst** _____ **Date** 12/28/01
**QC** _____ **Date** 12/28/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 32 **# Layers:** 44

**Collected Date:** 12/13/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/21/01
**Received By:** Santos, K.
**Received Date:** 12/19/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B84 | HB01-3796-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B84 | HB01-3796-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Amber |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B85 | HB01-3797-A | 1st Floor Room 120 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B85 | HB01-3797-B | 1st Floor Room 120 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

None Detected

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *0%*

*% Non Fibrous Materials:* *96%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B86 | HB01-3798-A | 1st Floor Room 120 A | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |
| Wollastonite | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B86 | HB01-3798-B | 1st Floor Room 120A | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 8% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 8%

**% Non Fibrous Materials:** 88%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B87 | HB01-3799 | 1st Floor Room 106 | 1 of 1 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 98%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B88 | HB01-3800 | 1st Floor Room 106 | 1 of 1 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 38% |
| Cellulose | 35% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 73%

**% Non Fibrous Materials:** 27%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B89 | HB01-3801 | 1st Floor Room 106 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B90 | HB01-3802 | 1st Floor Room 109 Kitchen | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B91 | HB01-3803-A | 1st Floor Room 108 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Red |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B91 | HB01-3803-B | 1st Floor Room 108 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B92 | HB01-3804-A | 1st Floor Room 108 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Red |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B92 | HB01-3804-B | 1st Floor Room 108 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *98%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10644
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B93 | HB01-3805 | 1st Floor Room 108 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Plaster | Gray |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B94 | HB01-3806-A | 1st Floor Room 108 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Red |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos: 0%***

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B94 | HB01-3806-B | 1st Floor Room 108 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

***% Asbestos: 0%***

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 99%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B95 | HB01-3807 | 1st Floor Room 111 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B96 | HB01-3808 | 1st Floor Room 113 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B97 | HB01-3809 | 1st Floor Room 120 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

*% Non Fibrous Materials:* *15%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B98 | HB01-3810 | 1st Floor Room 118 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

***% Other Fibrous Materials:* 85%**

***% Non Fibrous Materials:* 15%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B99 | HB01-3811 | 2nd Floor Room 230 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | White/Black |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | 2% |

***% Other Fibrous Materials:* 37%**

***% Non Fibrous Materials:* 63%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B100 | HB01-3812 | 2nd Floor Room 222 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Brown |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 5% |

***% Other Fibrous Materials:* 30%**

***% Non Fibrous Materials:* 70%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B101 | HB01-3813 | 2nd Floor Room 222 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | White/Black |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | 3% |

***% Other Fibrous Materials:* 38%**

***% Non Fibrous Materials:* 62%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B102 | HB01-3814 | 2nd Floor Room 227 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Yellow |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |
| Synthetic | 1% |

***% Other Fibrous Materials:* 2%**

***% Non Fibrous Materials:* 98%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B103 | HB01-3815 | 2nd Floor Room 221 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Black |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials:* 2%**

***% Non Fibrous Materials:* 98%**

**Sample Comments:** Thin black sheeting.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B104 | HB01-3816 | 2nd Floor Room 226 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B105 | HB01-3817 | 2nd Floor Room 284 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B106 | HB01-3818-A | 3rd Floor Room 364 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Cream |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B106 | HB01-3818-B | 3rd Floor Room 364 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *6%*

***% Non Fibrous Materials: 90%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B107 | HB01-3819-A | 3rd Floor Room 362 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B107 | HB01-3819-B | 3rd Floor Room 362 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 12% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *12%*

***% Non Fibrous Materials: 88%***

**Sample Comments:** <1% Chrysotile asbestos detected in mastic.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B108 | HB01-3820-A | 3rd Floor Room 367 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B108 | HB01-3820-B | 3rd Floor Room 367 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *5%*

***% Non Fibrous Materials:*** ***91%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B109 | HB01-3821-A | 3rd Floor Room 367 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B109 | HB01-3821-B | 3rd Floor Room 367 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *6%*

***% Non Fibrous Materials: 90%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B110 | HB01-3822-A | 3rd Floor Room 367 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B110 | HB01-3822-B | 3rd Floor Room 367 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *3%*

*% Other Fibrous Materials:* *6%*

***% Non Fibrous Materials: 91%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B111 | HB01-3823 | 3rd Floor Room 369 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B112 | HB01-3824-A | 3rd Floor Room 369 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B112 | HB01-3824-B | 3rd Floor Room 369 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *4%*

**% Non Fibrous Materials: 92%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B113 | HB01-3825 | 3rd Floor Room 371 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | White/Black |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | 2% |

*% Other Fibrous Materials:* *37%*

***% Non Fibrous Materials:* 63%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B114 | HB01-3826 | 3rd Floor Room 371 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Ceiling Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 38% |

*% Other Fibrous Materials:* *83%*

***% Non Fibrous Materials:* 17%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-357-JMV-B115 | HB01-3827 | 3rd Floor Room 380 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | White/Black |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | 3% |

*% Other Fibrous Materials:* *38%*

***% Non Fibrous Materials:* 62%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10644
**Report Date:** 12/26/01

Comments:

**Analyst** _____ **Date** 12/27/01
**QC** _____ **Date** 12/21/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 15 **# Layers:** 19

**Collected Date:** 12/17/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/27/01
**Received By:** Santos, K.
**Received Date:** 12/24/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B116 | HB01-3999 | 2nd Floor Room 211 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

***% Other Fibrous Materials:* 85%**

***% Non Fibrous Materials:* 15%**

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B117 | HB01-4000 | 2nd Floor Room 212 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

***% Other Fibrous Materials:* 85%**

***% Non Fibrous Materials:* 15%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B118 | HB01-4001 | 2nd Floor Room 213 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B119 | HB01-4002 | 2nd Floor Room 206 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B120 | HB01-4003 | 1st Floor Room 140 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B121 | HB01-4004-A | 1st Floor Room 130 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B121 | HB01-4004-B | 1st Floor Room 130 | 1 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

*% Asbestos:* *Trace*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:** <1%Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B122 | HB01-4005 | 1st Floor Room 122 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:** No mastic on tile.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B123 | HB01-4006-A | 1st Floor Room 125 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B123 | HB01-4006-B | 1st Floor Room 125 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *10%*

*% Non Fibrous Materials:* *90%*

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B124 | HB01-4007-A | 1st Floor Room 125 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B124 | HB01-4007-B | 1st Floor Room 125 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *3%*

*% Other Fibrous Materials:* *6%*

***% Non Fibrous Materials: 91%***

**Sample Comments:** Client requested positive stop.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B126 | HB01-4009 | 1st Floor Room 140 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials: 15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B127 | HB01-4010 | 1st Floor Room 125 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials: 15%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10710
Report Date: 12/28/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B128 | HB01-4011 | 1st Floor Room 130 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 85%*

*% Non Fibrous Materials: 15%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B129 | HB01-4012 | 1st Floor Room 130 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 85%*

*% Non Fibrous Materials: 15%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B130 | HB01-4013 | 1st Floor Room 125 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 85%*

*% Non Fibrous Materials: 15%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10710
**Report Date:** 12/28/01

Comments:

**Analyst** [illegible] **Date** 12/27/01
**QC** [illegible] **Date** 12/28/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10706
**Report Date:** 12/27/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 2 **# Layers:** 2

**Collected Date:** 12/17/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/27/01
**Received By:** Santos, K.
**Received Date:** 12/24/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B131 | HB01-4014 | 1st Floor Room 136 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*
*% Other Fibrous Materials:* *85%*
*% Non Fibrous Materials:* *15%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B132 | HB01-4015 | 1st Floor Room 135 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*
*% Other Fibrous Materials:* *85%*
*% Non Fibrous Materials:* *15%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10706
**Report Date:** 12/27/01

Comments:

**Analyst** Shad Wells **Date** 12·27·01
**QC** [illegible] **Date** 12-27-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10670
**Report Date:** 12/26/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 8 **# Layers:** 9

**Collected Date:** 12/18/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/26/01
**Received By:** Santos, K.
**Received Date:** 12/21/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B133 | HB01-3986-A | 1st Floor Room 132 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B133 | HB01-3986-B | 1st Floor Room 132 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *3%*

*% Non Fibrous Materials:* *97%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10670
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B134 | HB01-3987 | 1st Floor Room 131 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Multi-color |

*% Asbestos:* 0%

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 6% |

*% Other Fibrous Materials:* 6%

**% Non Fibrous Materials:** 94%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B135 | HB01-3988 | 1st Floor Room 131 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Sheet Rock | White/Tan |

*% Asbestos:* 0%

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 10% |
| Cellulose | 20% |

*% Other Fibrous Materials:* 30%

**% Non Fibrous Materials:** 70%

**Sample Comments:** No mud compound on sheet rock.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B136 | HB01-3989 | 1st Floor Room 130 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Brown |

*% Asbestos:* 0%

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* 4%

**% Non Fibrous Materials:** 96%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10670
**Report Date:** 12/26/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B137 | HB01-3990 | 1st Floor Room 140 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Silver/Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 94% |
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *94%*

***% Non Fibrous Materials:*** ***6%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B138 | HB01-3991 | 1st Floor Room 140 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Wrap | Silv/Wht/Yell. |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 20% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *50%*

***% Non Fibrous Materials:*** ***50%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B139 | HB01-3992 | 1st Floor Room 140 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Sheet Rock | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 10% |
| Cellulose | 25% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *35%*

***% Non Fibrous Materials:*** ***65%***

**Sample Comments:** No mud compound on sheet rock.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10670
**Report Date:** 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B140 | HB01-3993 | 1st Floor Room 125 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Sheet Rock | White/Tan |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 10% |
| Cellulose | 35% |

***% Other Fibrous Materials:* 45%**

***% Non Fibrous Materials:* 55%**

**Sample Comments:** No mud compound on sheet rock.

Comments:

**Analyst** Shad Wells **Date** 12·26·01

**QC** [signature] **Date** 12-26-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1202
**Client Project#:** 01-290

**Report #:** 10704
**Report Date:** 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B141 | HB01-4017 | 2nd Floor Room 213 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

*% Non Fibrous Materials:* *15%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-357-JMV-B142 | HB01-4018 | 2nd Floor Room 112 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

*% Non Fibrous Materials:* *15%*

**Sample Comments:**

Comments:

**Analyst** Shad Wells **Date** 12.27.01

**QC** [signature] **Date** 12-27-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-075
**Client Project#:** 01-290

**Report #:** 10968
**Report Date:** 1/14/02

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 6 **# Layers:** 6

**Collected Date:** 1/8/02
**Collected By:** Client
**TAT:** One week (or more
**Analysis By:** S. Wells
**Analysis Date:** 1/14/02
**Received By:** R. Hamasaki
**Received Date:** 1/10/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 357

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B143 | HB02-0107 | 3rd Floor Room 366 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Brown |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B144 | HB02-0108 | 3rd Floor Room 305 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Brown |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-075
Client Project#: 01-290

Report #: 10968
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B145 | HB02-0109 | 3rd Floor Room 306 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B146 | HB02-0110 | 2nd Floor Room 227 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B147 | HB02-0111 | 2nd Floor Room 244 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-075
Client Project#: 01-290

Report #: 10968
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-357-JMV-B148 | HB02-0112 | 2nd Floor Room 266 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 1/14/02

**QC** [signature] **Date** 1/15/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 12082
Report Date: 3/8/2002

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 1 # Layers: 3

Collection Date: 12/17/200
Collection By: Client
TAT: RUSH
Analysis By: S. Wells
Analysis Date: 3/8/2002
Received By: Santos, K.
Received Date: 3/8/2002

Project Name/Location: Quad C - Schofield Barracks - Bldg. 367
Building:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B125 | HB02-1115 | 1st Floor Room 125 | 1 of 2 |

| Asbestos | Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|---|
| None Detected | Non Friable | Yes | No | Tile | Beige |

Other Fibrous Materials

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 99%*

Sample Comments: Layer 2 of sample was analyzed prior to analysis.

Comments:

Analyst Sh Wells Date 3/8/02
QC Date 3-8-02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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December 28, 2001

Soil and Land Use Technology, Inc.
11609 Edmonston Road
Beltsville, Maryland 20705

Attn: Tina Perry

**RE: Revision to PLM sample results for sample numbers 121101-357-JMV-B77 thru B79**

Dear, Mrs. Tina Perry

On 12/17/01 Shad Wells analyzed samples from Bldg. 357 Scholfield Barracks. Sample 121101-357-JMV-B77 thru B79 had a fibrous material present in the second layer of caulking material that had the morphology of tremolite asbestos. The material was mounted in a refractive index oil of 1.605. The fibers produced dispersion staining colors not normally found associated with tremolite. Material was then mounted in a refractive index oil of 1.55 producing dispersion staining colors more closely associated with brucite/nemolite fibers. The fibers found in this material were also cross-referenced with SRM 1867 reference standards. Tina Perry was contacted and informed that these samples would be sent out for TEM bulk analysis at the cost of WEC for confirmation.

Results for TEM bulk analysis were received on 12/27/01 indicating that tremolite asbestos was present in white caulking material. Report number 10490 has been revised and the TEM analysis from EMSL has also been included in the packet for your review.

If you have any questions please feel free to call me at 843-0655 or 479-4747

Respectively submitted,

Shad Wells

Shad Wells- PLM Manager
White Environmental Consultants Inc.

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NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1202
Client Project#: 01-290

Report #: 10710
Report Date: 12/28/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B121 | HB01-4004-A | 1st Floor Room 130 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

*% Non Fibrous Materials:* 100%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B121 | HB01-4004-B | 1st Floor Room 130 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* Trace

*% Other Fibrous Materials:* 3%

*% Non Fibrous Materials:* 96%

Sample Comments: <1%Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

still pos even though they listed as trace

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-357-JMV-B122 | HB01-4005 | 1st Floor Room 122 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

*% Non Fibrous Materials:* 100%

Sample Comments: No mastic on tile.

FT-14
B121
B122
B133 → Tile - Neg
Mastic - 2%

**Globeteck** NVLAP® NVLAP ID# 200541-0

**544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987**

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name:*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** W. Bradley
***TAT:*** 3 Days
***Report No:*** 186
***Date Printed:*** 2/26/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 12 ***Total # of Layer(s):*** 12

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B149 | 022202-04 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Hw 206 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Calcite, Mica, Gypsum/Binder, Paint

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B150 | 022202-05 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Hw 227 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 0.5%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B151 | 022202-06 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Hw 266 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report es only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were ...ived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

# Globeteck

NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B152 | 022202-07 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Lanai-West **Materials:** Granular Matrix

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B153 | 022202-08 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Lanai-Center **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B154 | 022202-09 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 2nd Flr, Lanai-East **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B155 | 022202-10 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Hw 345 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 5-10%, Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B156 | 022202-11 | 2/22/02 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Hw 884 **Materials:** Composite Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica, Paint

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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NVLAP ID# 200541-0

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B157 | 022202-12 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Hw 306 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 5-10%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B158 | 022202-13 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Lanai-East **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B159 | 022202-14 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Lanai-Center **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-357-JSW-B160 | 022202-15 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 357, Quad C **Location:** 3rd Flr, Lanai-West **Materials:** Granular Matrix

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

Globeteck

**Analyst:** _____

for **Mohammad Rouf, MPH, CHMM**
**Laboratory Director**

Result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report is only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Quad C - Bldg #357 Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: 12-3-01 | Date: 12-03-01 10:45am |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| B1 | | Rm 155 | 11-30-01 | | |
| B2 | | Rm 146 | | | |
| B3 | | Rm 153 | | | |
| B4 | | Rm 153 | | | |
| B5 | | Rm 144 | | | |
| B6 | | Rm 144 | | | |
| B7, B8 | | Rm 144 | | | |
| B9, B10 | | Rm 144 - floor tile & Mastic | | | |
| B11, B12 | | Rm 144 - floor tile & Mastic | | | |
| B13, B14 | | Rm 144 - floor tile & Mastic | | | |
| B15, B16 | | Rm 144 - floor tile & Mastic | | | |
| B17 | | Rm 144 - | | | |
| B18 | | Rm 144 | | | |
| B19 | | Rm 377 | | | |
| B20 | | Rm 381 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| **Client Name:** SaLUT | **Project Name:** Quad C - Bldg # 357 Schofield Barracks |
| **Project Number:** 01-290 | |
| **Samples Relinquished by:** | **Sample Received by:** 12-03-01 10:45am |
| **Date:** 12-3-01 | **Date:** |
| **Samples Relinquished by:** | **Sample Received by:** S. Santos |
| **Date:** | **Date:** |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**
RUSH
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| B21 | | Rm 381 | 11-30-01 | | |
| B22 | | Rm 365 | | | |
| B23 | | Rm 381 | | | |
| B24, B25 | | Rm 369 - floor tile & Mastic | | | |
| B26, B27 | | Rm 369 - floortile & Mastic | | | |
| B28, B29 | | Rm 369 - floortile & Mastic | | | |
| B30, B31 | | Rm 369 - floortile & Mastic | | | |
| B32, B33 | | Rm 363 - floortile & Mastic | | | |
| B34 | | Rm 231 - | | | |
| B35, B36 | | Rm 227 - floortile & Mastic | | | |
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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Sa LUT | Project Name: Schofield Barracks Bldg 357 |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: 12-6-01 | Date: 12-7-01 @ 2:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 120601-357-JMV | B48 | Rm 264 2nd Floor | 12-6-01 | accepted | |
| | B49 | Rm 274 | | | 72 Hr |
| | B50 | Rm 270 | | | |
| | B51 | Rm 266 | | | |
| | B52 | Rm 261 | | | |
| | B53 | Rm 256 | | | |
| | B54 | Rm 303 3rd Floor | | | |
| | B55 | Rm 306 | | | |
| | B56 | Rm 306 | | | |
| | B57 | Rm 306 | | | |
| | B58 | Rm 310 | | | |
| | B59 | Rm 320 | | | |
| | B60 | Rm 300 | | | |
| | B61 | Rm 300 | | | |
| | B62 | Rm 300 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 357, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: R. Santos |
| Date: | Date: 12-7-01 @ 2:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**
~~RUSH~~
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 120701-357-JMV | B63 | 3rd FLR, Rm 343 | 12/07/01 | accepted | |
| | B64 | Rm 342 | | | 72 HR |
| | B65 | Rm 354 | | | |
| | B66 | Rm 332 | | | |
| | B67 | Rm 345 | | | |
| | B68 | Rm 387 | | | |
| | B69 | Rm 356 | | | |
| | B70 | Rm 358 | | | |
| | B71 | Rm 321 | | | |
| | B72 | Rm 318 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 357, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: Tina Pecoraro | Sample Received by: K. Santos |
| Date: 12/12/01 | Date: 12-12-01 @ 10:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121101-357-JMV | B73 | Exterior : North : Fan Outlets 1st FLR | 11 Dec 01 | accepted | 72 HR |
| | B74 | " | | | |
| | B75 | " | | | |
| | B76 | Exterior : West, above window Rm 109 | | | |
| | B77 | : off Fan Outlets 1st FLR | | | |
| | B78 | " | | | |
| | B79 | " | | | |
| | B80 | " : East, above window Rm 138 | | | |
| | B81 | " East / Rm 142 1st FLR | | | |
| | B82 | " North / Rm 138 " | | | |
| | B83 | " West / Rm 120 " | | | |
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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BUDG 357 Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: [illegible] | Sample Received by: S. Santos |
| Date: 12/19/01 | Date: 12-19-01 9:10am |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121301-357-JMV | B84 | 1st FLR, Rm 118 | 13 Dec 01 | A | |
| | B85 | " " 120 | | | |
| | B86 | " " 120A | | | |
| | B87 | " " 106 | | | |
| | B88 | " " 106 | | | |
| | B89 | " " 106 | | | |
| | B90 | " " 109 Kitchen | | | |
| | B91 | " " 108 | | | |
| | B92 | " " 108 | | | |
| | B93 | " " 108 | | | |
| | B94 | " " 108 | | | |
| | B95 | " " 111 | | | |
| | B96 | " " 113 | | | |
| | B97 | " " 120 | | | |
| | B98 | " " 118 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Sabut | Project Name: BLDG 357, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-18-01 9:10 am. |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1311) **OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121301-357-JMV | B99 | 2nd FLR, Rm 230 | 13Dec01 | A | |
| | B100 | " " 222 | | | |
| | B101 | " " 222 | | | |
| | B102 | " " 227 | | | |
| | B103 | " " 221 | | | |
| | B104 | " " 226 | | | |
| | B105 | " " 284 | | | |
| | B106 | 3rd FLR, " 364 | | | |
| | B107 | " " 362 | | | |
| | B108 | " " 367 | | | |
| | B109 | " " 367 | | | |
| | B110 | " " 367 | | | |
| | B111 | " " 369 | | | |
| | B112 | " " 369 | | | |
| | B113 | " " 371 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 357, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-19-01 9:10am |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121301-357-JMV | B114 | 3rd FLR, Rm 371 | 13 Dec 01 | A | |
| " | B115 | " " 380 | | | |
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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg # 357 Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: K-Santos |
| Date: 12-24-01 | Date: 12-24-01 @ 11:00 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121701-357-JMV- | B116 | Rm 211 | 12-17-01 | Accepted | |
| | B117 | Rm 212 | | | 72 HR |
| | B118 | Rm 213 | | | |
| | B119 | Rm 206 | | | |
| | B120 | Rm 140 | | | |
| | B121 | Rm 130 | | | |
| | B122 | Rm 122 | | | |
| | B123 | Rm 125 | | | |
| | B124 | Rm 125 | | | |
| | B125 | Rm 125 | | | |
| | B126 | Rm 140 | | | |
| | B127 | Rm 125 | | | |
| | B128 | Rm 130 | | | |
| | B129 | Rm 130 | | | |
| | B130 | Rm 125 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg # 357 - Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: K-Santos |
| Date: 12-24-01 | Date: 12-24-01 @ 11:00 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121701-357-JMV | B131 | Rm 136 | 12-17-01 | Accepted | |
| ↓ | B132 | Rm 135 | ↓ | | 72 Hr |
| 121801-357-JMV | B133 | Rm 132 | 12-18-01 | | |
| ↓ | B141 | Rm 213 | | | |
| | B142 | Rm 211 | ↓ | | |
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Form 463
QAC Initials GCS
G. Stangenhoup Rev. B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS, INC.

2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 357, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 12-21-01 @ 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1311) OTHER (specify analysis and method below)

Turn-around Time: ~~RUSH~~ 24 48 72 HOUR ~~5 DAY~~

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 121801-357-JMV | B133 | 1st FLR, Rm 132 | 18 Dec 01 | | 72 Hour |
| | B134 | Rm 131 | | | |
| | B135 | Rm 131 | | | |
| | B136 | Rm 130 | | | |
| | B137 | Rm 140 | | | |
| | B138 | Rm 140 | | | |
| | B139 | Rm 140 | | | |
| | B140 | Rm 125 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request.



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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg # 357 - Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: K-Santos |
| Date: 12-24-01 | Date: 12-24-01 @ 11:00 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24.48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121701-357-JMV | B131 | Rm 136 | 12-17-01 | Accepted | |
| ↓ | B132 | Rm 135 | ↓ | ↓ | 72 Hr |
| 121801-357-JMV | B133 | Rm 132 | 12-18-01 | | |
| ↓ | B141 | Rm 213 | ↓ | | |
| | B142 | Rm 211 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks, BLDG 357, Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: [illegible] | Sample Received by: R. Samarali [illegible] |
| Date: 1/10/02 | Date: 01-10-02 @ 11:15 am Thrs. |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)

LEAD: Air ([illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)

TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 010802-357-JMV | B143 | 3rd FLR, Rm 366 | 8 Jan 02 | accepted | |
| | B144 | Rm 305 | | | |
| | B145 | Rm 306 | | | |
| | B146 | 2nd FLR, Rm 227 | | | |
| | B147 | Rm 244 | | | |
| | B148 | Rm 266 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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# Sample Chain of Custody

| | |
|---|---|
| **Client Name:** SaLUT | **Project Name:** Schofield Barracks Bldg # 357 |
| **Project Number:** 01-290 Schofield Barracks | |
| **Samples Relinquished by:** JSW | **Sample Received by:** Rachel Hamaguchi |
| **Date:** 01/23/02 | **Date:** 01.23.02 @ 12:45 |
| **Samples Relinquished by:** Josh Willa | **Sample Received by:** |
| **Date:** 01/23/02 | **Date:** |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

**Turn-around Time**
**RUSH**
**24 48 72 HOUR**
**5 DAY**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 012302-357-KV2 | B149 | Ext of room 150 - window | 01/23/02 | | |
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*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
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pg 1 of 2

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

022202 -

# CHAIN OF CUSTODY

Project Name: Schofield Barracks, BLDG 357 - Quad C
Client: Salut
Project #: 01-290
Sampled by: JSW
Sample Date: 02/19/02
Turn Around Time: ~~5 DAY~~ 3 Day

ANALYSIS REQUESTED

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|---|
| 04 | 021902-357-JSW-B149 | 2nd FLR, HW 206 | | | | | | | |
| 05 | B150 | HW 227 | | | | | | | |
| 06 | B151 | HW 266 | | | | | | | |
| 07 | B152 | Lanai - West | | | | | | | |
| 08 | B153 | - Center | | | | | | | |
| 09 | B154 | - East | | | | | | | |
| 10 | B155 | 3rd FLR, HW 345 | | | | | | | |
| 11 | B156 | Rm 384 | | | | | | | |
| 12 | B157 | HW 306 | | | | | | | |
| 13 | B158 | Lanai - East | | | | | | | |

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 | Time/Date: 2/22/02 | Time/Date: |

pg 2 of 2

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# CHAIN OF CUSTODY

022202 -

Project Name: SB, BLDG 357 - Quad C
Client:
Project #
Sampled by:
Sample Date: 02/19/02
Turn Around Time:

ANALYSIS REQUESTED: Asbestos PLM/PCM (X), Lead Air/Wipe, Lead Paint/Soil, TCLP Pb, TCLP 8 Metals, Arsenic Samples, Total RCRA 8 Metals

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|
| 14 021902-357-3SW-B159 | 3rd FLR, Lanai - Center | ↓ | | | | | | |
| 15 ↓ B160 | ↓ ↓ - West | ↓ | | | | | | |

| | | |
|---|---|---|
| Relinquished by: [signature] | Received by: | Relinquished by: |
| Signature: [signature] | Signature: | Signature: |
| Time/Date: 2/22/02 @ 10am | Time/Date: | Time/Date: |

**Laboratory Quality Control Results**
**And**
**Chains of Custody**

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hrs.
**Report No:** 106
**Date Printed:** 1/23/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 7 **Total # of Layer(s):** 10

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B5 | 120401-01 | 12/4/1 | 1 of 1 | None Detected | Blue | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 1st Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B9, B10 | 120401-02 | 12/4/1 | 1 of 2 | None Detected | Blue | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 1st Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B9, B10 | 120401-02 | 12/4/1 | 2 of 2 | None Detected | Brown | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 1st Floor, Rm, Floor Tile **Materials:** Mastic

**Other Fibrous Materials:** Cellulose< 1%
**Non-Fibrous Materials:** Adhesive/Binder, Calcite

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result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report es only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were ...ved. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B15 | 120401-03 | 12/4/1 | 1 of 1 | Chrysotile | Gray | 1-3% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 1st Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B20 | 120401-04 | 12/4/1 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 3rd Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B24 | 120401-05 | 12/4/1 | 1 of 2 | None Detected | Blue | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 3rd Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B24 | 120401-05 | 12/4/1 | 2 of 2 | Chrysotile | Black | 1-3% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 3rd Floor, Rm, Floor Tile **Materials:** Mastic

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Asphalt/Binder, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B30 | 120401-06 | 12/4/1 | 1 of 2 | None Detected | Tan | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 3rd Floor, Rm, Floor Tile **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B30 | 120401-06 | 12/4/1 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 3rd Floor, Rm, Floor Tile **Materials:** Mastic

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Asphalt/Binder, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B34 | 120401-07 | 12/4/1 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, 2nd Floor, Rm, Floor Tile **Materials:** Compressed Fibrous Material

**Other Fibrous Materials:** Cellulose 20-30% Mineral Wool 5-10%

**Non-Fibrous Materials:** Perlite, Paint, Glassbeads, Glue/Binder

**Analyst:** _____

Mohammad Bouri, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hrs
**Report No:** 109
**Date Printed:** 1/23/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 3

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B41 | 120601-03 | 12/6/01 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, Room 249 **Materials:** Gray Cloth

**Other Fibrous Materials:** Fibrous Glass 30-40%
**Non-Fibrous Materials:** Glue/Binder, Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B46 | 120601-04 | 12/6/01 | 1 of 2 | Chrysotile | Green | 1-3% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, Room 256 **Materials:** Green Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B46 | 120601-04 | 12/6/01 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #357, Room 256 **Materials:** Black Mastic

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Asphalt/Binder, Calcite

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Analyst: _____

for Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SALUT
**Client Address:** 3375 Koapaka St.
Hon, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 259-41
**Date Printed:** 12/14/2001
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120601-357-JMV-B48 | 121001-20 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Tan | N/A |

**Project Name:** Bldg. 357, Schofield Barracks **Location:** Bldg. 357, 2nd Floor, Room 264 **Materials:** Tan Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcareous Matrix, Mica
**Sample Comments:**

Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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## Bulk Asbestos Analysis

### EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SALUT
**Client Address:** 3375 Koapaka St.
Hon, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 259-39
**Date Printed:** 12/14/2001
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120701-357-JMV-B72 | 121001-28 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Black | N/A |

**Project Name:** Bldg # 357, Schofield Barracks **Location:** Bldg. 357, Room 318 **Materials:** Black Asphaltic Mastic

**Other Fiberious Materials:**

**Non Fiberous Materials:** Asphalt/Binder, Calcite

**Sample Comments:**

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**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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## Bulk Asbestos Analysis

### EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 50
**Date Printed:** 1/3/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121101-357-JMV-B81 | 010202-09 | 12/12/2001 | 1/2/2002 | 1 of 1 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, Ext. Room 142 **Materials:** Gray Hard Material

**Other Fiberious Materials:**

**Non Fiberous Materials:** Gypsum, Binder, Calcite, Mica

**Sample Comments:**

Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

Globeteck NVLAP NVLAP ID# 200541-0

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 48
**Date Printed:** 1/3/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 3

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B89 | 010202-03 | 12/19/2001 | 1/2/2002 | 1 of 2 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 1st Floor, Room 106 **Materials:** Plaster

**Other Fiberious Materials:**
**Non Fiberous Materials:** Gypsum, Binder, Calcite, Mica
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B89 | 010202-03 | 12/19/2001 | 1/2/2002 | 2 of 2 | Non-Detected | Yellow | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 1st Floor, Room 106 **Materials:** Paint

**Other Fiberious Materials:** Cellulose <1%
**Non Fiberous Materials:** Gypsum, Binder, Calcite
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B115 | 010202-04 | 12/19/2001 | 1/2/2002 | 1 of 1 | Non-Detected | Black | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 3rd Floor, Room 380 **Materials:** Black Cloth

**Other Fiberious Materials:** Fibrous Glass 10-20%
**Non Fiberous Materials:** Rubber, Binder, Mica
**Sample Comments:**

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

# AMA Analytical Services, Inc.

Electron & Optical Microscopy Services

## CERTIFICATE OF ANALYSIS

NVLAP NY ELAP AIHA

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | SaLUT, Inc. | **Job Name:** | Schofield Barracks | **Chain Of Custody:** | 92216 |
| **Address:** | 11609 Edmonston Road | **Job Location:** | Building 357 - Quad C | **Date Analyzed:** | 04/30/2002 |
| | Beltsville, Maryland 20705 | **Job Number:** | 01-290 | **Person Submitting:** | Ken Reynolds |
| | | **P.O. Number:** | Not Provided | | |

**Attention:** Tina Perry-Finau



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0244063 | 120301-357-JMV-B41 | NAD | -- | -- | -- | -- | -- | 30 | -- | -- | -- | 70 | Black | LB | |
| 0244064 | 120301-357-JMV-B46 | TR [1] | TR | -- | -- | -- | -- | -- | -- | -- | -- | 100 | Beige | LB | |
| 0244065 | 120601-357-JMV-B48 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | Off-White | LB | |
| 0244066 | 120701-357-JMV-B72 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | Black | LB | |
| 0244067 | 121101-357-JMV-B81 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | Off-White | LB | |
| 0244068 | 121301-357-JMV-B89 | NAD | -- | -- | -- | -- | -- | -- | -- | -- | -- | 100 | Gray | LB | |
| 0244069 | 121301-357-JMV-B115 | NAD | -- | -- | -- | -- | -- | 40 | -- | -- | -- | 60 | Black | LB | |
| 0244070 | 121801-357-JMV-B135 | NAD | -- | -- | -- | -- | -- | 5 | 3 | -- | -- | 92 | White | LB | |

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. All rights reserved. AMA Analytical Services, Inc.

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory

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# AMA Analytical Services, Inc.

Electron & Optical Microscopy Services

NVLAP NY ELAP AIHA

## CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| Client: | SaLUT, Inc. | Job Name: | Schofield Barracks | Chain Of Custody: | 92216 |
| Address: | 11609 Edmonston Road | Job Location: | Building 357 - Quad C | Date Analyzed: | 04/30/2002 |
| | Beltsville, Maryland 20705 | Job Number: | 01-290 | Person Submitting: | Ken Reynolds |
| | | P.O. Number: | Not Provided | | |



Attention: Tina Perry-Finau

## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Luis Bustillos

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. All rights reserved. AMA Analytical Services, Inc.

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Quad C - Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by:
Sample Date: 11-30-01
Turn Around Time: 72 hr

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| 204010 | B5 | Bldg #357 - 1st floor - Rm - floortile | ✓ | | | | | | | |
| 02 | B9, B10 | Bldg # 357 - 1st floor - Rm - floortile & Mastic | ✓ | | | | | | | |
| Bldg #357 03 | B15 | Bldg #357 - 1st floor - Rm - floortile | ✓ | | | | | | | |
| 04 | B20 | Bldg #357 - 3rd floor - Rm - floortile | ✓ | | | | | | | |
| 05 | B24 | Bldg #357 - 3rd floor - Rm - floortile | ✓ | | | | | | | |
| 06 | B30 | Bldg # 357 - 3rd floor - Rm - floortile | ✓ | | | | | | | |
| 07 | B34 | Bldg # 357 - 2nd floor - Rm - Ceiling Tile | ✓ | | | | | | | |
| 08 | B5 | Bldg #358 - 1st floor - Rm 166 - Ceiling Tile | ✓ | | | | | | | |
| 09 | B10 | Bldg #358 - 1st floor - Rm 162 - floortile | ✓ | | | | | | | |
| Bldg #358 10 | B15 | Bldg #358 - 2nd floor - Rm 277 - Pipe insul. | ✓ | | | | | | | |

| | | |
|---|---|---|
| Relinquished by: J. Willard | Received by: Ulliber 12/03/01 | Relinquished by: |
| Signature: | Signature: | Signature: |
| Time/Date: | Time/Date: 12/03/01. | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Quad C - Schofield Barracks
Client: SaLUT
Project # 01.290
Sampled by:
Sample Date: 11-30-01
Turn Around Time: 72 hr

ANALYSIS REQUESTED

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| 11 | B20 | Bldg # 358 - 2nd floor - Rm 275 - floortile | ✓ | | | | | | | |
| 12 | B25 | Bldg # 358 - 3rd floor - Rm 372 - floortile | ✓ | | | | | | | |
| 13 | B30 | Bldg # 358 - 3rd floor - Rm 365 - Mastic | ✓ | | | | | | | |
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| Relinquished by: J. Willard | Received by: | Relinquished by: |
|---|---|---|
| Signature: [signature] | Signature: | Signature: |
| Time/Date: | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Bldg # 357 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-18-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 910202-11 121801-357-JMV-B135 | Rm 131 | X | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 12/20/01 | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: 01-290 Schofield Barracks
Client: Sa LUT
Project # 01-290 Bldg 357
Sampled by: John Uerrch
Sample Date: 12-6-01
Turn Around Time: 72hr.

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 120601-357-JMU-B48 | Rm 264, 2nd Fl. Bldg 357 | X | | | | | | | |
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| Relinquished by: | Received by: Gabriel Imamura | Relinquished by: |
| Signature: | Signature: G Imamura | Signature: |
| Time/Date: | Time/Date: 12/7/01 | Time/Date: |

Due 12/12/01

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# CHAIN OF CUSTODY

Project Name: Bldg # 357 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-07-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 21001-28 120701-357-JMV-B72 | Rm 318 | | | | | | | | |
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Relinquished by: John Willard
Signature:
Time/Date: 1430 12-7-01

Received by: Mohammad Rouf
Signature:
Time/Date: 12-7-01

Relinquished by:
Signature:
Time/Date:

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Honolulu, Hawaii 96819
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# CHAIN OF CUSTODY

Project Name: Bldg # 357, Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-11-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 121101-357-JMV-B81 | Ext. Rm 142 | ✓ | | | | | | | |
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|---|---|---|
| Relinquished by: [illegible] | Received by: | Relinquished by: |
| Signature: [illegible] | Signature: | Signature: |
| Time/Date: 12/12/01 @ 9:00 am | Time/Date: | Time/Date: |

**AMA Analytical Services, Inc.**

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# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 92216

**MAILING ADDRESS:**

1. Submittal Date: 29 MAR 02
2. Client Name: SALUT
3. Street/RFD/P.O. Box: 3375 Koapaka St. STE B286
4. City, State, Zip: Hon. Hi. 96819
5. Contact Person: Tina Perry-Finney

Job Name/location: Schofield Barracks, BLDG 357 - Quad C
Job #: 01-290 P.O. #:
Bill To: SALUT
Phone #: 808-833-6155 Fax: 808-833-6156
Submitted By: Ken Reynolds (Print) Ken Reynolds (Signature)

6. DATE & TIME RESULTS REQUIRED: 4/30/02 Time: ~~1200~~ 1200 AM PM ☐ IMMED ☐ 24HR ☐ 48HR ☐ 72HR ☒ 5-DAY OTHER (Specify)

**SAMPLE DATA:**

1. Analysis Type: ☒ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☒ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify):
2. Total Number Of Samples: TEM ____ PCM ____ PLM 8 LEAD ____ OTHER (Specify)
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: PC ☐ MCE ☐ B. Porosity ____ Micron C. Diameter ☐ 37mm ☐ 25mm
4. LEAD SAMPLES Wipe Type: ☐ Pace ☐ Palintest ☐ Ghost ☐ Lynx Products ☐ Other (Specify)
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☒ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS TEM | PCM | PLM | LEAD | OTHER | MATRIX AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120301-357-JMV-B41 | | 2nd FLR, Rm 249 | 12/03/01 | | | | | | | | | | | | |
| 120301-357-JMV-B46 | | 2nd FLR, Rm 259 | 12/03/01 | | | | | | | | | | | | |
| 120601-357-JMV-B48 | | 2nd FLR, Rm 264 | 12/06/01 | | | | | | | | | | | | |
| 120701-357-JMV-B72 | | 3rd FLR, Rm 318 | 12/07/01 | | | | | | | | | | | | |
| 121101-357-JMV-B81 | | 1st FLR, East of Rm 142 | 12/11/01 | | | | | | | | | | | | |
| 121301-357-JMV-B89 | | 1st FLR, Rm 106 | 12/13/01 | | | | | | | | | | | | |
| 121301-357-JMV-B115 | | 3rd FLR, Rm 380 | 12/13/01 | | | | | | | | | | | | |
| 121801-357-JMV-B135 | | 1st FLR, Rm 131 | 12/18/01 | | | | | | | | | | | | |

**REPORTING DATA:**

1. Verbal Results To Whom? Name: ____ Phone: ____ Beeper: ____
2. Date Written Results Required ___/___/___

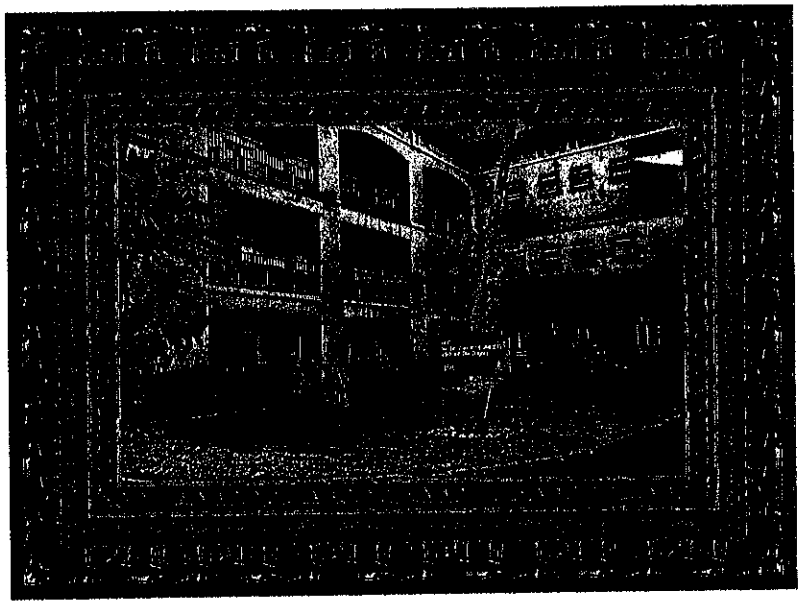
**LABORATORY STAFF ONLY: CUSTODY**

1. Date/Time RCVD: 4/30/02 @ 1200 Via: [illegible] By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: 4/30/02 By (Print): [illegible] Sign: [illegible]
3. Results Reported To: T. PERRY-FINNEY Via: [illegible] Date: 4/30/02 Time: [illegible] Initials: [illegible]
4. Comments:

ATTACHMENT 20

BLDG 358

# Schofield Barracks

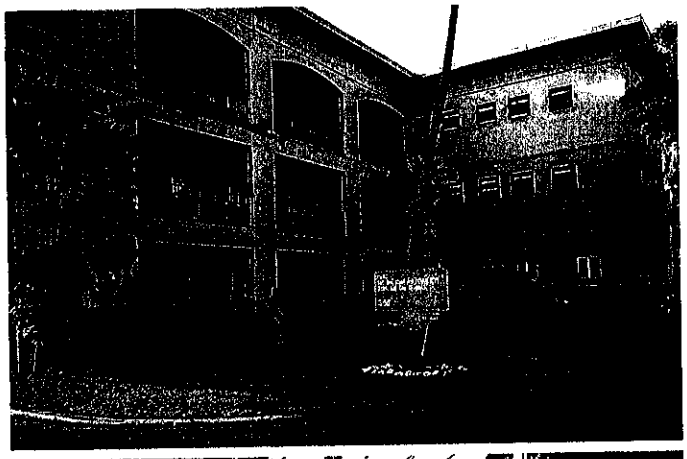


# Building 358

# Executive Summary

Soil and Land Use Technology, Inc. (SaLUT) performed an asbestos identification and assessment reinspection of Building 358 located at Schofield Barracks, Hawaii. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 358 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included to the extent that the suspect materials found in those surveys could be identified. The survey was conducted by SaLUT in accordance with the U.S. Army Corps of Engineers Honolulu Engineer District Scope of Work dated September 18, 2001. The survey was conducted December 13, 2001, through February 19, 2002.

All accessible areas of the building were inspected for suspect asbestos-containing building materials (ACBMs). One hundred and eighty-four samples of suspect asbestos containing material were collected. Analytical results confirmed that asbestos is present as floor tile and floor tile mastic. A summary of the ACBMs encountered is provided on the next page. This report provides a detailed description of the ACBM locations, quantities, and hazard assessments based on conditions existing at the time of the inspection. No areas were found to contain ACBM causing high or imminent exposure potential.



*Photograph 1. Front of Building 358.*

*Photograph 2. Rear of Building 358.*

## BUILDING SUMMARY

| | |
|---|---|
| **Facility** | Schofield Barracks |
| **Building** | 358 |
| **Inspector(s)** | John Willard, Kenneth Reynolds, John Veitch |
| **Inspection Date(s)** | November 30, 200, through February 19, 2002 |
| **Building Area** | 90,000 sf |

**Inaccessible areas (overview)**

None

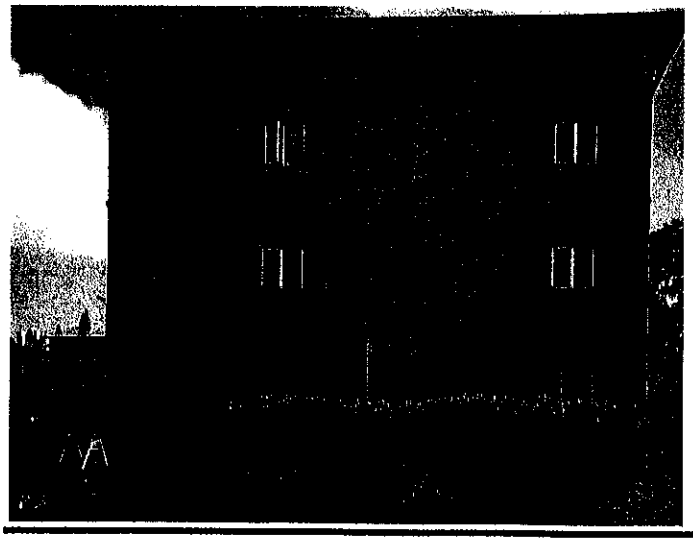
**Areas with limited access (overview)**

Beneath wall-to-wall carpeting ("LCA" on building drawings)

**Areas with no access (overview)**

Above ceilings with no access ("NAC" on building drawings)
Rooms that were sealed ("NA" on building drawings)

| Types of ACBMs Encountered | | Approximate Quantity |
|---|---|---|
| **Thermal System Insulation** | None | |
| **Surfacing** | None | |
| **Miscellaneous** | Floor Tile<br>Floor Tile Mastic | 28,253sf<br>45,974 sf |
| **Functional Areas with High to Imminent Exposure Potential** | None | |



*Photograph 3. Side of Building 358.*

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| 4 | FM1 | 8 |
| 5 | FT2 and FM2 | 8 |
| 6 | FT3 and FM3 | 8 |
| 7 | FM4 | 8 |
| 8 | FM6 | 9 |
| 9 | FM11 | 9 |
| 10 | FT16, FM16, FT18, and FM18 | 9 |
| 11 | FM17, FM19, FT21, and FM21 | 9 |
| 12 | FT8 and FM8 | 9 |

# 1 Introduction

SaLUT performed an inspection of Building 357 to identify and assess all accessible ACBMs. This was a reinspection conducted at various times between December 11, 2001 and February 19, 2002 in accordance with the requirements outlined in the Scope of Work dated September 18, 2001. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 357 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included.

The following is a description of the building:

| | |
|---|---|
| **Function** | Barracks |
| **Size** | 90,000 square feet; three floors |
| **Foundation** | Concrete |
| **Exterior walls** | Concrete masonry units with plaster coating |
| **Roof** | Metal |
| **Mechanical systems** | Main mechanical room containing furnace and boiler on First Floor; secondary mechanical rooms on Second and Third Floors; pipes are insulated with fiberglass and foam |
| **Climate control** | Central heating system; individual room air conditioning units; ducts are insulated with foil-wrapped fiberglass |
| **Interior walls** | Concrete masonry units, drywall, plaster |
| **Floors** | Floor tile, concrete, ceramic tile, carpet |
| **Ceilings** | Ceiling tiles; fixed ceilings with ceiling plaster in some spaces |

Survey and assessment protocols were based on those adopted by the U.S. Environmental Protection Agency (EPA) as detailed in the Asbestos Hazard Emergency Response Act (AHERA; 40 CFR 763, Subpart E), and those of the Hawaii Department of Health in Hawaii Administrative Rule (HAR) 11-502 *Asbestos-Containing Materials in Schools.* In addition to identifying materials considered suspect by AHERA survey protocols, accessible roofing and other exterior materials were also addressed. SaLUT's inspectors identified and sampled all materials considered to be suspect under the regulations and other documents listed in Section 2 *Applicable Documents,* as well as those materials that have been found through other available literature and inspectors' experience (e.g., leveling paper and silver exterior paint) to potentially contain asbestos. This report does not address those suspect materials that would be expected in the building (e.g., sink undercoating in bathrooms of a residence)but were not encountered; the reader should assume that, if a suspect material is not mentioned in Section 3 *Findings,* the material was not found in the building.

Survey and assessment protocols were based on those adopted by the U.S. Environmental Protection Agency (EPA) as detailed in the Asbestos Hazard Emergency Response Act (AHERA; 40

CFR 763, Subpart E), and those of the Hawaii Department of Health in Hawaii Administrative Rule (HAR) 110502 *Asbestos-Containing Materials in Schools*. In addition to identifying materials considered suspect by AHERA survey protocols, accessible roofing and other exterior materials were also addressed. All samples were collected in accordance with the Sampling and Analysis Plan (SAP) for the task. The SAP is located in Appendix A of this volume. On-site inspection and assessments were conducted by Messers John Willard, Kenneth Reynolds, and John Veitch, EPA-accredited Asbestos Inspectors. Quality control review was conducted by Mr. Jeffrey Bauer, CIH, P.E., CSP (Certified Industrial Hygienist for this task) and Dr. David M. Heisler (Principal Investigator).

For the following reasons, SaLUT's survey differed from a normal reinspection, wherein the locations and conditions of previously identified ACBMs are verified, and the impacts of building renovations are determined:

- **Inability to identify the Baker survey's homogeneous materials with certainty.** Photographs of the positive materials were not included in the Baker inspection report available at the Directorate of Public Works (DPW). Many of the types of floor tile in the original survey were described by their predominant color only. Other types of floor tile appear to have received more than one description (possibly due to having been described by different inspectors).

- **Multiple layers of floor tile.** Many rooms had multiple layers of floor tile. Numerous instances were identified where floor tile located in the 1993 survey had been covered by other types of tile. This made it impractical to carry out the following tasks with completed accuracy:
  - Verify all locations of floor tiles identified in the original survey
  - Quantify types of floor tile
  - Identify all types of floor tile in the building (it was assumed that all types of floor tile were visible in at least one location)

To deal with these issues, under the direction of SaLUT's Project Manager and Principal Investigator, the inspectors modified the survey protocol as follows:

- **Floor tile.** Where a floor tile type could be sampled by SaLUT's inspectors without causing unacceptable damage, the original inspection was ignored, the floor tile was given a SaLUT homogeneous material identification, and the floor tile was sampled in accordance with the SAP. If the material could be equated to a type of Baker floor tile, this was noted. Where older types of floor tile were noted below SaLUT's samples, but the older materials could not be sampled, the floor tile and associated mastic were identified from the material locations in Baker's report. Quantities of asbestos-containing floor tile and associated floor tile mastic below the top layer of floor tile were assumed to extend throughout the entire room.

- **Other materials identified in previous inspections.** For all other materials (including those that were determined to not contain asbestos) that had been identified in the previous inspections, SaLUT's inspectors attempted to locate the materials. In a number of cases, the materials had been abated during various renovation projects.

The DPW survey identified one positive material (thermal system insulation on a pipe elbow, located in Room 142) not identified in the Baker survey. No photograph of this positive material was included in the inspection report. SaLUT's inspectors were unable to locate this material. It is possible that the material was abated.

- **Other materials not identified in previous inspection.** SaLUT's inspectors identified and sampled a number of suspect materials (e.g., types of caulking) that were not identified previously.
- **Ceiling Tile.** A number of samples were taken by SaLUT to confirm Baker's results that all no ceiling tiles contained asbestos. At that point, SaLUT stopped sampling ceiling tile and Baker's inspection results were accepted.

All samples were collected in accordance with the Sampling and Analysis Plan (SAP) for the task except as noted above. Where applicable, corners of wall-to-wall carpeting were lifted to examine flooring materials under the carpet. Metal roofs that would not support the inspector's weight were examined visually; if suspect materials were identified they were presumed to contain asbestos unless they could be sampled from an accessible edge of the roof. These situations, as well as other special situations, are discussed in the SAP located in Appendix A of this volume.

On-site inspection and assessments were conducted by John Willard, Kenneth Reynolds, and John Veitch, EPA and State of Hawai'i accredited Asbestos Inspectors. Quality control review was conducted by Dr. David M. Heisler (Principal Investigator).

# 2 Applicable Documents

The following are the regulations, standards, and other documents applicable to the survey:

**U.S. Army Publications**

| | |
|---|---|
| AR 200-1 | Environmental Protection and Enhancement |
| AR 385-40 | Accident Reporting and Records |
| EM 385-1-1 | USACE, Safety and Health Requirements Manual, 3 Sep 96 |
| AR-420-70 | Building and Structures |
| TB 420-70-8 | Asbestos Survey and Abatement |

**Title 29 Code of Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration Standards**

| | |
|---|---|
| Part 1910.20 | Access to Employee Exposure and Medical Records |
| Part 1910.95 | Occupational Noise Exposure |
| Part 1910.134 | Respiratory Protection |
| Part 1910.1000 | Air Contaminants – Permissible Exposure Limits |
| Part 1910.1001 | Asbestos |
| Part 1910.1200 | Hazard Communication |
| Part 1926.59 | Hazard Communication Construction |
| Part 1926.1101 | Asbestos in Construction |

**Title 40 Code of Federal Regulations, Environmental Protection Agency Standards**

| | |
|---|---|
| Part 61 Subpart A | National Emission Standards for Hazardous Air Pollutants |
| Part 763 | Asbestos Hazard Emergency Response Act |

**American National Standards Institute Standards**

| | |
|---|---|
| Z9.2-1979 | Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| Z88.20-1988 | Practices for Respiratory Protection |

**U.S. Environmental Protection Agency Guidelines**

| | |
|---|---|
| EPA/600/R-93/116 | Method of the Determination of Asbestos in Bulk Building Materials |
| EPA/5605-85-024 | Guidance for Controlling Asbestos Containing Building Materials |

**Underwriters Laboratories, Inc. Publications**

| | |
|---|---|
| 586-77 (R-1982) | Test Performance of High Efficiency Particulate Air Filter Units |

**State of Hawai'i Occupational Safety and Health Standards**

| | |
|---|---|
| HIOSH 12-145 | Asbestos in Construction |

**Hawai'i Administrative Rules**

| | |
|---|---|
| Chapter 11-501 | Asbestos Requirements |
| Chapter 11-502 | Asbestos Containing Materials in Schools |
| Chapter 11-503 | Fees for Asbestos Removal and Certification |
| Chapter 11-504 | Asbestos Abatement Certification Program |

**USAED, Honolulu Contractual Documents**

| | |
|---|---|
| Contract DACA83-01-D-0017 | Indefinite-Delivery Indefinite-Quantity (IDIQ) Services Contract for Asbestos/Lead Survey and Abatement Services for Honolulu Engineer District (HED) Area of Responsibility, 14 September 2001 |
| Contract DACA83-01-D-0017<br>Task Order 0001<br>Scope of Work | Asbestos Survey for Various Buildings at Pohakuloa Training Area, Wheeler Army Airfield, Fort Shafter, Tripler Army Medical Center, Waianae Recreational Center, Pohakuloa Training Area and Kiluea Military Reservation, Hawaii |

**Previous Asbestos Surveys**

*Asbestos Survey and Management Plan Report for Building 358 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter

*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii

# 3 Findings

Seventy homogeneous materials suspected of potentially containing asbestos were identified and sampled by SaLUT. SaLUT also identified, but did not sample, an additional six types of floor tile and six types of floor tile mastic that were found to be ACBM by Baker. SaLUT collected 184 bulk asbestos samples that were analyzed by White Environmental Consultants, Inc. and Globeteck at their National Voluntary Laboratory Accreditation Program (NVLAP) - accredited laboratories in Honolulu using polarized light microscopy/dispersion staining (PLM/DS) techniques. For some homogeneous materials, the laboratories used a *stop on positive* procedures whereby if one sample was confirmed as ACBM, the remaining samples were not analyzed. Composite samples of floor tile and floor tile mastic were split and the two components were analyzed individually as required by AHERA regulations. Therefore, the number of samples collected differs from the number of analyses. SaLUT submitted duplicates of sixteen of the samples analyzed by White to Globeteck for quality control analysis. One layer (floor tile) of two samples (B30 and B59) was found by Globeteck to be ACBM.

As a result of these laboratory analyses, 17 homogeneous materials (four types of floor tile, thirteen types of floor tile mastic) were confirmed as ACBM by sample analysis, in addition to three types of floor tile that were confirmed by Baker's analysis as being ACBM although SaLUT's analysis did not reveal asbestos. Four other types of asbestos-containing floor tile their associated asbestos-containing mastic identified by Baker remained in the building. The condition of the encountered positive materials was good, although some floor tiles are broken. Photographs 4 through 12 illustrate the ACBMs sampled by SaLUT. SaLUT was unable to photograph the ACBMs identified by Baker because they located below underneath floor tile sampled by SaLUT and were only revealed in the small areas where SaLUT's samples were taken.

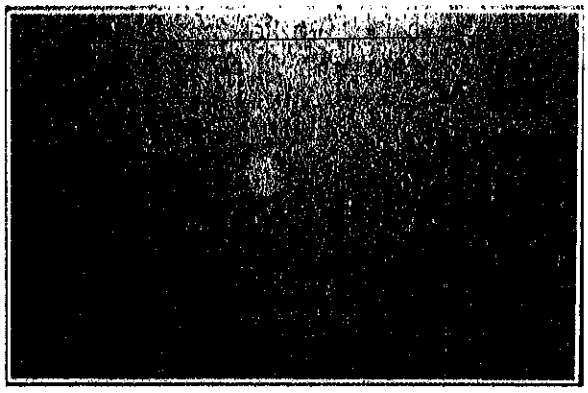
Baker indicated that plaster on the Second Floor interior was ACBM. Anecdotal evidence from various sources mentions occasional plaster samples from the exteriors of Quad buildings that were ACBM. However, as was the case for SaLUT's plaster samples, all of Baker's plaster samples from Quad C contained either no asbestos or less than 1 percent asbestos. Therefore, under AHERA and SaLUT's SAP, none of the plaster is ACBM.

All identified homogeneous materials considered to be potentially asbestos containing ("suspect") are listed on the *Homogeneous Materials Listing* (Table 1). These materials are grouped according to class (i.e., miscellaneous, surfacing, and thermal system insulation) and floor of the building. For each suspect material, the friability, general locations in the building, and sample numbers are indicated, as well as whether the material was determined to be ACBM or not. Red sample numbers indicate those samples that contained asbestos. Gray sample numbers indicate samples that were not analyzed because another sample of the same material contained asbestos. Suspect materials identified as ACBM by quality control analysis are identified by an asterisk (*) following the appropriate sample number. The ACBMs identified by Baker and not sampled by SaLUT are listed following SaLUT's homogeneous materials.

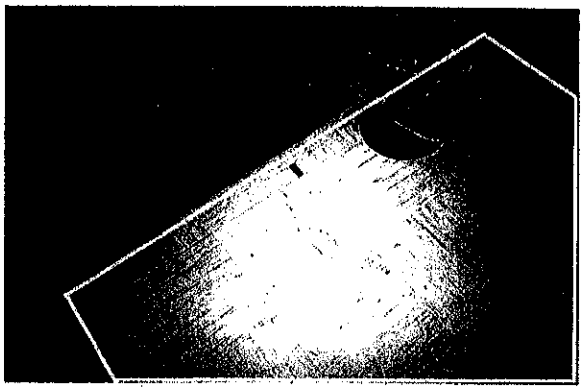
Sample collection sites for identified suspect ACBMs, as well as locations of identified ACBMs, are indicated on the building drawings (Figure 1).

Table 2, *Summary of Asbestos-Containing Materials,* provides a summary of the encountered ACBMs in the building. Each material is listed with information regarding the type, location, and condition of the ACBM, along with the recommended response action for the material.

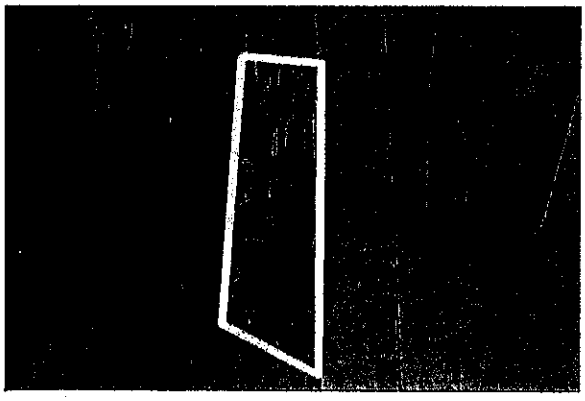
Laboratory analysis sheets for all samples collected by SaLUT, including the quality control analyses, are located at the end of this report. Laboratory analysis sheets for samples collected during the previous surveys are found in those reports.



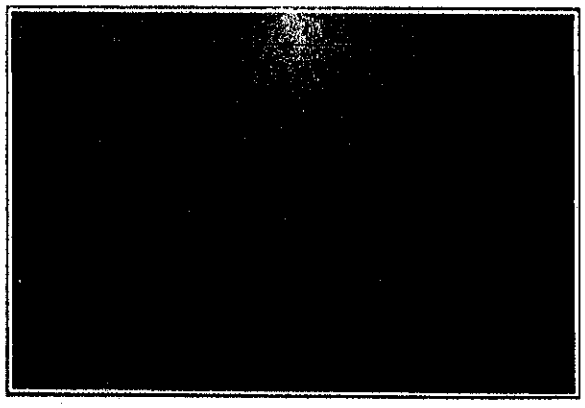
*Photograph 4. FM1. The mastic (FM1) below this floor tile (FT1) contains asbestos. The floor tile does not.*



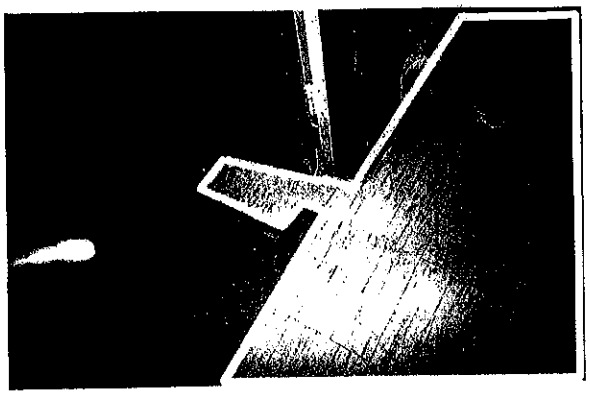
*Photograph 5. FT2 and FM2. This floor tile (FT2) and the mastic below it (FM2) both contain asbestos.*



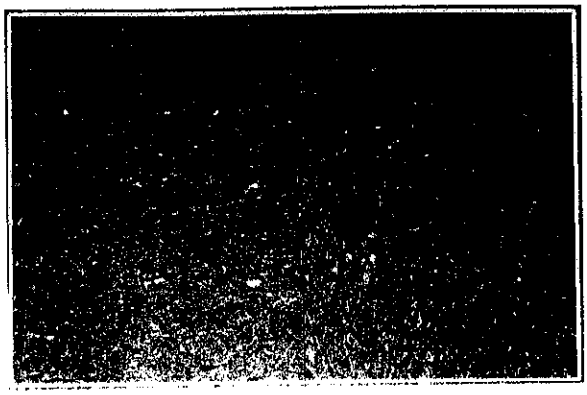
*Photograph 6. FT3 and FM3. This floor tile (FT3) and the mastic below it (FM3) both contain asbestos.*



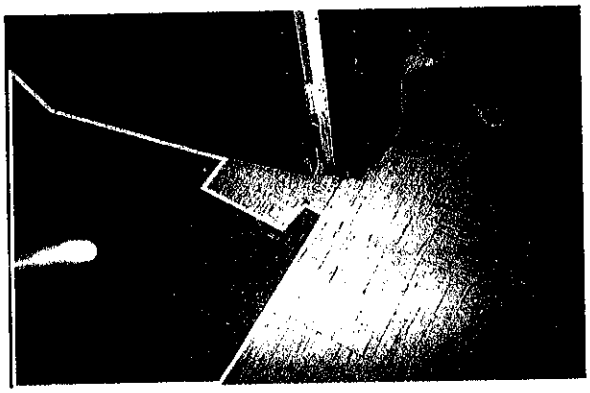
*Photograph 7. FM4. The mastic (FM4) below this floor tile (FT4) contains asbestos. The floor tile does not.*



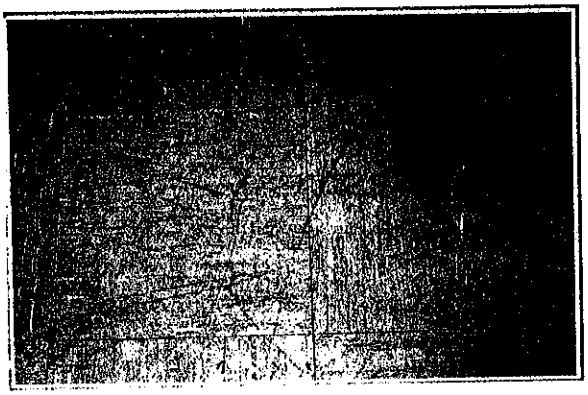
*Photograph 8. FM6. The mastic (FM6) below this floor tile (FT6) contains asbestos. The floor tile does not.*



*Photograph 9. FM11. The mastic (FM11) below this floor tile (FT11) contains asbestos. The floor tile does not.*



*Photograph 10. FT16, FM16, FT18, and FM18. This floor tile (FT16 on the First Floor and FT18 on the Second Floor) and the mastics below it (FM16 and FM18) all contain asbestos.*



*Photograph 11. FM17, FM19, FT21, and FM21. The mastics below this floor tile (FM17 below FT17 on the First Floor, FM19 below FT19 on the Second Floor, and FM21 below FT21 on the Third Floor) all contain asbestos. FT21 also contains asbestos. FT17 and FT19 do not contain asbestos.*

*Photograph 12. FT8 and FM8. This floor tile (FT8) and the mastic below it (FM8) both contain asbestos.*

**Table 1. Homogeneous Materials Listing. Descriptions of asbestos-containing materials from Baker's survey are taken from Baker's report.**

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| Material Description | | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| AD1 | White adhesive | No | Behind wall carpet in Rooms 140, 148, 167 | B3, B51, B100 | No | |
| BM1 | White baseboard mastic | No | Rooms 104, 125, 169 | B4, B53, B70, B6 | No | |
| CT1 | 2′ x 4′ white ceiling tile | Yes | Rooms 105, 127, 166, 175, 179 | B2, B5, B46, B47, B72, B131, B132 | No | |
| DW3 | Sheetrock | Yes | Rooms 104, 134, 151 | B179, B180, B181 | No | |
| FM1 | Black mastic | No | Below FT1 | B9, B48, B63 | Yes | 4,446 sf |
| FM2 | Black mastic | No | Below FT2 | B12, B49, B71, B56, B59, B62 | Yes | 1,858 sf |
| FM3 | Black mastic | No | Below FT3 | B10, B33, B167 | Yes | 1,397 sf |
| FM4 | Black mastic | No | Below FT4 | B11, B34 | Yes | 1,397 sf |
| FM6 | Black/amber mastic | No | Below FT6 | B64, B65, B66 | Yes | 750 sf |
| FM10 | Black/amber mastic | No | Below FT10 | B74, B75, B76 | Yes | 160 sf |
| FM11 | Black/amber mastic | No | Below FT11 | B77, B78, B79 | Yes | 1,302 sf |
| FM14 | Black mastic | No | Below FT14 | B50, B52, B55, B58, B61 | No | |
| FM15 | Black mastic | No | Below FT15 | B54, B57, B60, B69, B96, B97 | No | |
| FM16 | Black mastic (same as Baker's M002) | No | Below FT16 | B130, B133, B162 | Yes | 1,087 sf |
| FM17 | Black mastic (same as Baker's M013) | No | Below FT17 | B134, B135, B163 | Yes | 952 sf |
| FT1 | 12″ x 12″ tan floor tile with gray specks | No | Hallways 125-127, Rooms 106, 110, 112, 115, 119, 145, 155, 161, 161B, 165-168 | B7, B48, B63 | No | |
| FT2 | 12″ x 12″ white floor tile with brown streaks | No | Rooms 108, 109, 122, 140, 156, 164 | B8, B49, B71, B56, B59*, B62 | Yes | 1,434 sf |
| FT3 | 4″ x 12″ green floor tile with white streaks | No | Room 162 | B10, B33, B167, B168 | Yes | 1,397 sf |
| FT4 | 12″ x 12″ brown floor tile with white specks | No | Room 162 | B11, B34, B160, B161 | No | |
| FT6 | 12″ x 12″ white floor tile with brown specks | No | Rooms 101, 107, 111, 113, 114 | B64, B65, B66 | No | |
| FT10 | 12″ x 12″ dark gray floor tile | No | Room 105 | B74, B75, B76 | No | |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| FT11 | 12″ x 12″ gray floor tile with white specks | No | Rooms 117, 119, 159 | B77, B78, B79 | No | |
| FT14 | 12″ x 12″ white floor tile with brown and gray streaks | No | Rooms 122, 129-133, 134, 140 | B50, B52, B55, B58, B61 | No | |
| FT15 | 12″ x 12″ blue floor tile with white specks | No | Hallways 146-148, Rooms 104, 142, 149, 150, 152, 153, 154 | B54, B57, B60, B69, B96, B97 | No | |
| FT16 | 12″ x 12″ olive floor tile (same as Baker's M001) | No | Rooms 107, 164, 165, 166, 167, 179 | B130, B133, B162 | Yes Notes 1, 2 | 1,087 sf |
| FT17 | 12″ x 12″ cream floor tile (same as Baker's M012) | No | Rooms 110, 111, 112, 113, 168 | B134, B135, B163 | Yes Notes 1, 2 | 952 sf |
| VJ1 | Air conditioning vibration dampener | No | Rooms 101, 114, 142 | B68, B73, B98 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M008 | 12″ x 12″ floor tile Beige | No | Rooms 104, 113, 145, 155, 156, 169-175, 180 | See Baker's report | Yes | 2,154 sf |
| M009 | Flooring adhesive Black | No | Below M008 | See Baker's report | Yes | 2,154 sf |
| M010 | 9″ x 9″ Floor Tile Black | No | Room 103 | See Baker's report | Yes | 364 sf |
| M011 | Flooring adhesive Black | No | Below M010 | See Baker's report | Yes | 364 sf |
| Second Floor | | | | | | |
| AD2 | White adhesive covered with blue paint | No | Rooms 265, 288 | B22, B147, B148 | No | |
| BM2 | White/yellow baseboard mastic | No | Hallway 226, Room 244 | B13, B40, B108 | No | |
| BM4 | Dark brown baseboard mastic | No | Rooms 206, 207 | B82, B83, B87 | No | |
| CT3 | 2′ x 4′ white ceiling tile (pinhole and gouge pattern) | Yes | Rooms 205, 207, 229, 232, 234, 271, 273, 277 | B18, B36, B37, B38, B81, B86, B142, B143 | No | |
| DW1 | Sheetrock | Yes | Rooms 206, 264, 287 | B170, B171, B172 | No | |
| FM5 | Black mastic | No | Below FT5 | B14, B101, B111 | No | |
| FM12 | Black mastic | No | Below FT12 | B21, B39, B149 | No | |
| FM13 | Black mastic | No | Below FT13 | B35, B80 | No | |
| FM18 | Black mastic (same as Baker's M028) | No | Below FT18 | B136, B145, B146 | Yes | 6,236 sf |
| FM19 | Black mastic | No | Below FT19 | B137, B141, B144 | Yes | 9,242 sf |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| Material Description | | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| FM20 | Black/yellow mastic | No | Below FT20 | B138, B139, B140 | No | |
| FT5 | 12″ x 12″ white floor tile with gray specks | No | Rooms 200-203, 205-207, 208-217, 219, 220, 222, 225-240, 241-257, 260, 262-274, 277 | B14, B101, B111 | No | |
| FT12 | 12″ x 12″ tan floor tile with gray specks | No | Rooms 226, 264, 275 | B20, B39, B149 | No | |
| FT13 | 12″ x 12″ white floor tile with brown and gray streaks | No | Rooms 205, 239 | B35, B80 | No | |
| FT18 | 12″ x 12″ olive floor tile (same as Baker's M027) | No | Rooms 205-207, 226-228, 243-245, 263-266, 276, 277, 288, 289 | B136, B145, B146 | Yes Note 1 | 6,236 sf |
| FT19 | 12″ x 12″ cream floor tile (same as Baker's M043) | No | Rooms 200, 203, 208-217, 219, 220, 222, 225, 229-240, 262, 263, 267-270, 272-276 | B137, B141, B144 | No | |
| FT20 | 12″ x 12″ White floor tile with brown streaks | No | Room 275 | B138, B139, B140 | No | |
| SK1 | Sink undercoating | No | Rooms 218 (men's latrine), 221, 256 | B88, B89, B110 | No | |
| VJ2 | Air conditioning dampener | No | Rooms 250, 251, 259 | B84, B105, B106, B107 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M035 | 12 x 12 floor tile White with gray | No | Room 277 | See Baker's report | Yes | 290 sf |
| M036 | Flooring adhesive Black | No | Below M035 | See Baker's report | Yes | 290 sf |
| Third Floor | | | | | | |
| AD3 | White adhesive | No | Behind wall carpet in rooms 307, 345, 365 | B26, B91, B126 | No | |
| BM3 | White baseboard mastic | No | Rooms 349, 366, 384 | B23, B45, B113 | No | |
| BM5 | Dark brown baseboard mastic | No | Room 306 | B92, B93 | No | |
| CT4 | 2′ x 4′ white ceiling tile | Yes | Rooms 327, 354, 359, 365, 381 | B24, B32, B42, B116, B117, B118, B121, B122, B123 | No | |
| DW2 | Sheetrock | Yes | Hallways 305, 326, 365 | B173, B174, B175 | No | |
| FM7 | Black mastic | No | Below FT7 | B25, B41, B44, B90, B112 | No | |
| FM8 | Black mastic (same as Baker's M054) | No | Below FT8 | B28, B30, B124 | Yes | 3,952 sf |
| FM21 | Black mastic (same as Baker's M059) | No | Below FT21 | B150, B151, B152 | Yes | 9,935 sf |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| FT7 | 12" x 12" white floor tile with gray specks | No | Rooms 300, 303, 305-317, 319, 320, 322, 325-342, 343-355, 357, 360, 362-377, 382-389 | B41, B44, B90, B112 | No | |
| FT8 | 12" x 12" olive/tan floor tile (same as Baker's M053) | No | Rooms 304-307, 324, 326-328, 343-345, 359, 362-366, 377, 382- 389 | B27, B29, B30*, B124 | Yes | 3,952 sf |
| FT21 | 12" x 12" cream floor tile (same as Baker's M058) | No | Rooms 300, 303, 308-317, 319, 320, 322, 325, 329-342, 346-355, 357, 360, 369-376 | B150, B151, B152 | Yes | 9,935 sf |
| SK2 | Sink undercoating | No | Rooms 318 (men's latrine), 321, 356 | B94, B95, B125 | No | |
| VJ3 | Air conditioning vibration dampener | No | Rooms 354, 355, 359 | B114, B119, B120 | No | |
| ACBMs From Baker Survey Located by SaLUT | | | | | | |
| M056 | 12 x 12 floor tile Green | No | Room 365 | See Baker's report | Yes | 452 sf |
| M057 | Flooring adhesive Black | No | Below M056 | See Baker's report | Yes | 452 sf |

| Surfacing Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| PL4 | Plaster coating on permanent building structure | No | Hallways of rooms 106, 126, 151 | B164, B165, B166 | No | |
| PL5 | Plaster coating on walls | No | Hallways 105, 148, 165 | B176, B177, B178 | No | |
| Second Floor | | | | | | |
| PL1 | Wall plaster | Yes | Rooms 244, 254 | B102, B103, B109 | No | |
| PL3 | Plaster coating on permanent building structure | No | Hallways of rooms 226, 243, 265 | B156, B157, B158 | No | |
| PL6 | Latham plaster over wire framework (covered with blue and brown paint) | No | Rooms 221, 277, 279 | B16, B17, B19, B169 | No | |
| Third Floor | | | | | | |
| PL2 | Plaster coating on permanent building structure | No | Hallways of rooms 327, 345, 365 | B153, B154, B155 | No | |

| Thermal System Insulation Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| DI1 | Air conditioning duct insulation | No | Rooms 101, 142, 175 | B1, B67, B99 | No | |
| TK1 | Canvas-type tank insulation | No | Boiler room (room 116) | B182, B183, B184 | No | |
| MJ1 | Mudded joint | Yes | Boiler furnace (mechanical room) | B127, B128, B129 | No | |
| Second Floor | | | | | | |
| DI2 | Air conditioning duct insulation | No | Rooms 207, 244, 277 | B15, B85, B104 | No | |
| Third Floor | | | | | | |
| DI3 | Air conditioning duct insulation | No | Rooms 340, 354, 365 | B31, B43, B115 | No | |

(*) Denotes material confirmed as ACBM by QC sample analysis.

Note 1 — Although SaLUT's samples were negative for asbestos, Baker's samples of the same material contained greater than 2 percent asbestos.

Note 2 — Two layers of this floor tile were found in most of these rooms; square footage is for one layer.

# FIGURE 1

# BUILDING DRAWING LEGEND

| ASBESTOS CONTAINING MATERIALS AND QUANTITIES | |
|---|---|
| FT/ FM | Floor Tile and/or Mastic |

| ACCESSIBILITY | |
|---|---|
| NAC | NO ACCESS ABOVE CEILING |
| NA | NO ACCESS TO THIS SPACE |
| LCA | LIMITED ACCESS BENEATH CARPET |

| SYMBOLS | |
|---|---|
| 100 | SPACE NUMBER |
| B25 | POSITIVE BULK SAMPLE LOCATION |
| B35 | NEGATIVE BULK SAMPLE LOCATION |
| B45 | NOT ANALYZED BULK SAMPLE LOCATION |

FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 358
FIRST FLOOR

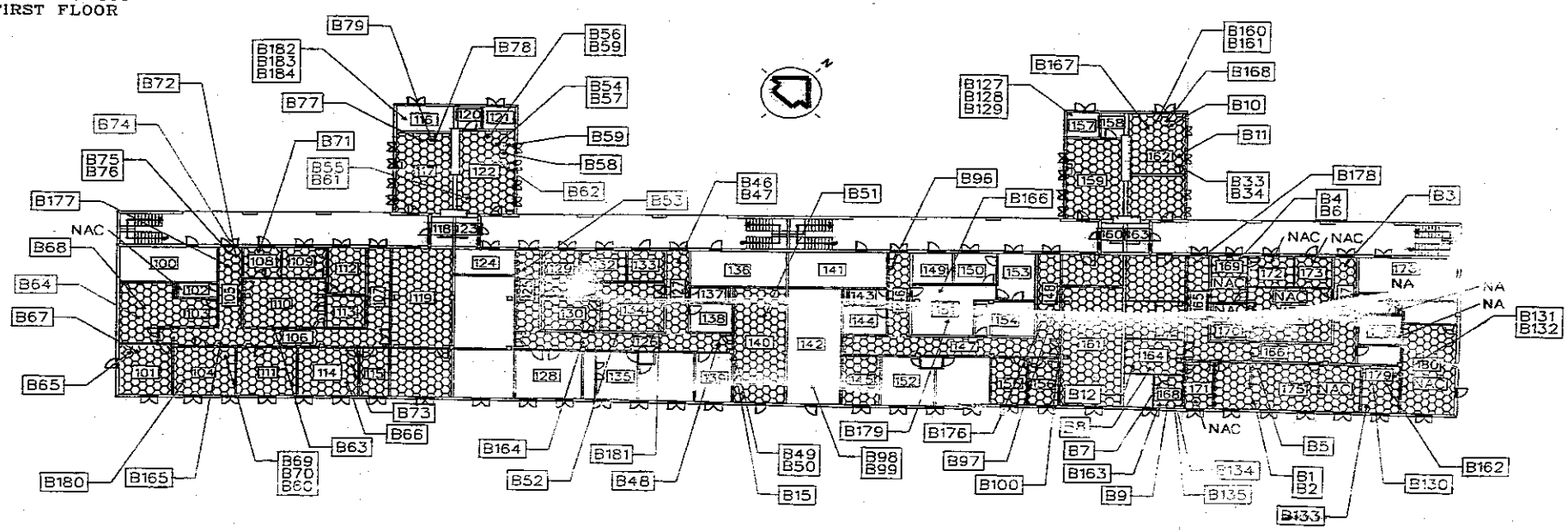


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 358
SECOND FLOOR

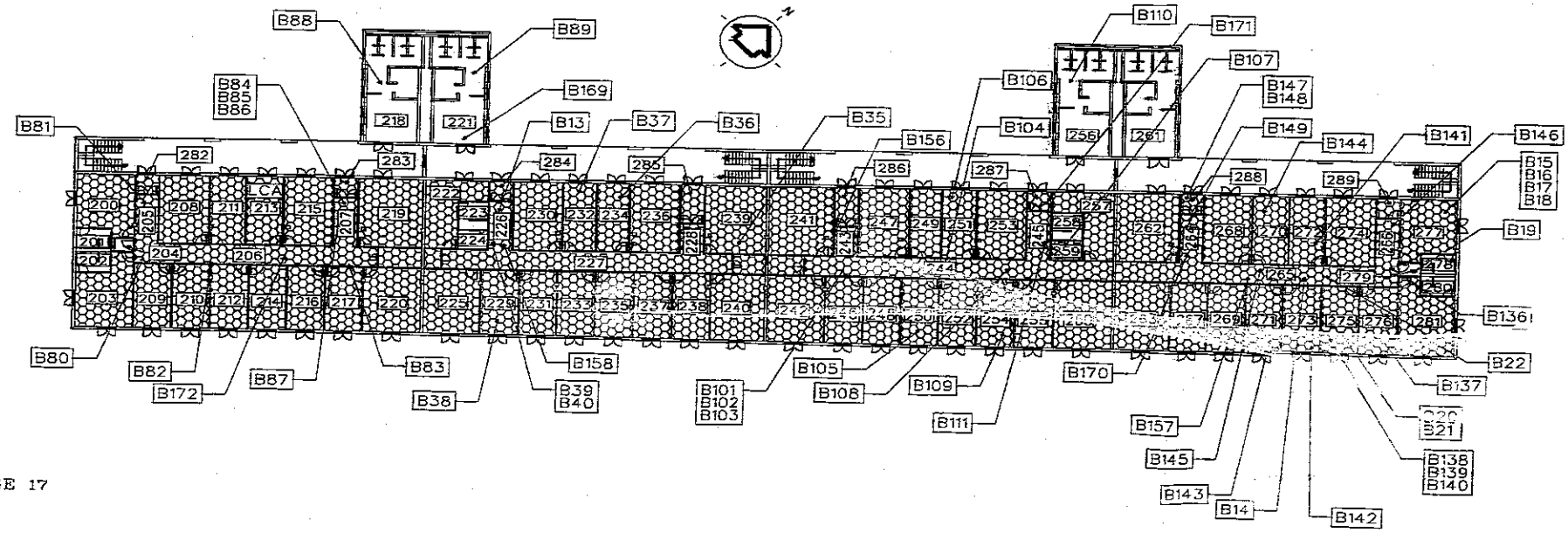
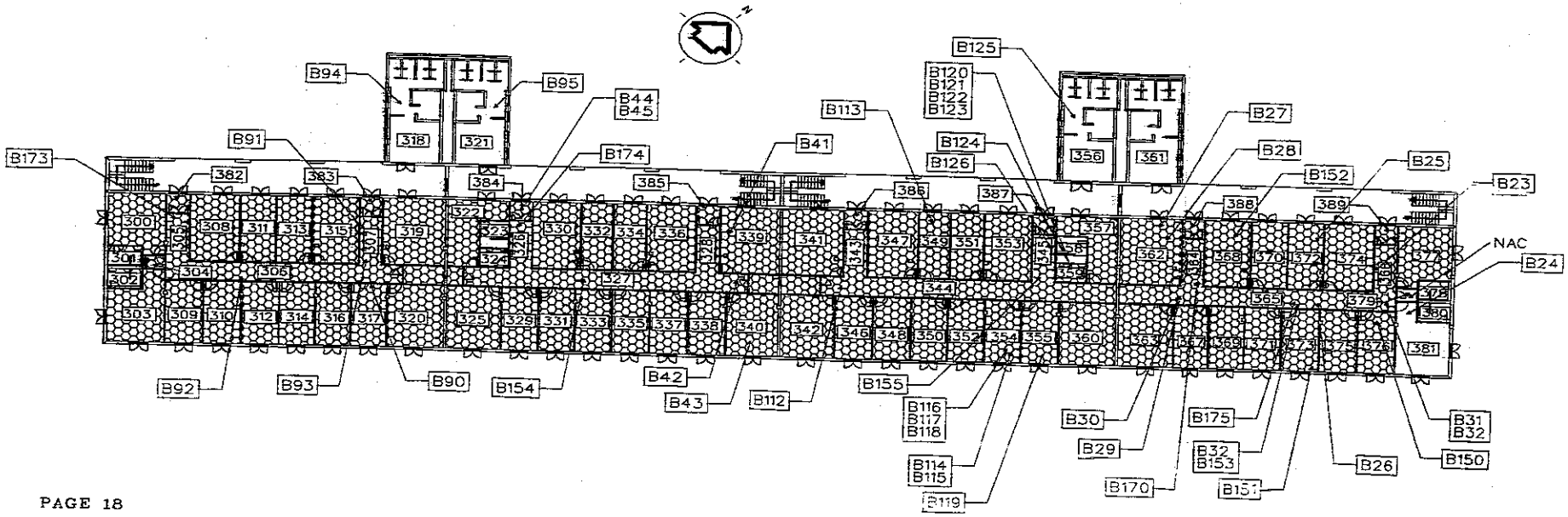


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 358
THIRD FLOOR



# 4 Recommendations

Each friable ACBM was assessed and placed in the appropriate AHERA category as specified in 40 CFR, Part 763.88. In addition to the seven AHERA assessment categories, SaLUT added an eighth category for all non-friable ACBM.

SaLUT also categorized the condition of each ACBM at the time of the survey, as follows:

**Good** No damage observed

**Fair** The area of distributed damage was less than 10 percent and greater than 2 percent. The area of localized damage was less than 25 percent and greater than 2 percent.

**Poor** The area of distributed damage was greater than 10 percent and the localized damage was greater than 25 percent.

Based on the AHERA assessment category and SaLUT's condition assessment, SaLUT recommends on or more of the following response actions for each ACBM:

**O&M** Maintain the ACBM. Perform operations and maintenance procedures in a manner that does not damage the material. These procedures are specified in 29 CFR 1926.1101 and HAR 11-502-10. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

**Repair** Damaged areas should be repaired. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

Undamaged and repaired materials are subject to the O&M response action.

**Remove** The material should be removed. Removal must be performed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

If the building is demolished or renovation will impact any ACBMs, those materials must be removed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

Table 2 provides the AHERA assessment category, SaLUT's condition assessment, and SaLUT's recommended response action for each ACBM.

**Table 2. Summary of Asbestos-Containing Materials.**

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| First Floor | | | | | | | |
| FM1 Black mastic | Below FT1 (Hallways 125-127, Rooms 106, 110, 112, 115, 119, 145, 155, 161, 161B, 165-168) | 4,446 sf | No | Good | 8 | O&M | 4 |
| FM2 Black mastic | Below FT2 | 1,858 sf | No | Good | 8 | O&M | 5 |
| FM3 Black mastic | Below FT3 (Room 162) | 1,397 sf | No | Good | 8 | O&M | 6 |
| FM4 Black mastic | Below FT4 (Room 162) | 1,397 sf | No | Good | 8 | O&M | 7 |
| FM6 Black/amber mastic | Below FT6 (Rooms 101, 107, 111, 113, 114) | 750 sf | No | Good | 8 | O&M | 8 |
| FM10 Black/amber mastic | Below FT10 (Room 105) | 160 sf | No | Good | 8 | O&M | None |
| FM11 Black/amber mastic | Below FT11 (Rooms 117, 119, 159) | 1,302 sf | No | Good | 8 | O&M | 9 |
| FM16 Black mastic (same as Baker's M002) | Below FT16 (Rooms 107, 164, 165, 166, 167, 179) | 1,087 sf | No | Good | 8 | O&M | 10 |
| FM17 Black mastic (same as Baker's M013) | Rooms 110, 111, 112, 113, 168 | 952 sf | No | Good | 8 | O&M | 11 |
| FT2 12" x 12" white floor tile with brown streaks | Rooms 108, 109, 122, 140, 156, 164 | 1,434 sf | No | Good | 8 | O&M | 5 |
| FT3 4" x 12" green floor tile with white streaks | Room 162 | 1,397 sf | No | Good | 8 | O&M | 6 |
| FT16 12" x 12" olive floor tile (same as Baker's M001) | Rooms 107, 164, 165, 166, 167, 179 | 1,087 sf | No | Good | 8 | O&M | 10 |
| FT17 12" x 12" cream floor tile (same as Baker's M012) | Rooms 110, 111, 112, 113, 168 | 952 sf | No | Good | 8 | O&M | 11 |
| M008 12" x 12" floor tile Beige | Rooms 104, 113, 145, 155, 156, 169-175, 180 | 2,154 sf | No | Good | 8 | O&M | None |
| M009 Flooring adhesive Black | Below M008 | 2,154 sf | No | Good | 8 | O&M | None |
| M010 9" x 9" Floor Tile Black | Room 103 | 364 sf | No | Good | 8 | O&M | None |
| M011 Flooring adhesive Black | Below M010 | 364 sf | No | Good | 8 | O&M | None |

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| Second Floor | | | | | | | |
| FM18 Black mastic | Below FT18 | 6,236 sf | No | Good | 8 | O&M | 10 |
| FM19 Black mastic | Below FT19 (Rooms 200, 203, 208-217, 219, 220, 222, 225, 229-240, 262, 263, 267-270, 272-276) | 9,242 sf | No | Good | 8 | O&M | 11 |
| FT18 12"x12" olive floor tile (same as Baker's M027) | Rooms 205-207, 226-228, 243-245, 263-266, 276, 277, 288, 289) | 6,236 sf | No | Good | 8 | O&M | 10 |
| M035 12 x 12 floor tile White with gray | Room 277 | 290 sf | No | Good | 8 | O&M | None |
| M036 Flooring adhesive Black | Below M035 | 290 sf | No | Good | 8 | O&M | None |
| Third Floor | | | | | | | |
| FM8 Black mastic | Below FT8 | 3,952 sf | No | Good | 8 | O&M | 12 |
| FM21 Black mastic | Below FT21 | 9,935 sf | No | Good | 8 | O&M | 11 |
| FT8 12" x 12" olive/tan floor tile (same as Baker's M053) | Rooms 304-307, 324, 326-328, 343-345, 359, 362-366, 377, 382- 389 | 3,952 sf | No | Good | 8 | O&M | 12 |
| FT21 12" x 12" cream floor tile | Rooms 300, 303, 308-317, 319, 320, 322, 325, 329-342, 346-355, 357, 360, 369-376 | 9,935 sf | No | Good | 8 | O&M | 11 |
| M056 12 x 12 floor tile Green | Room 365 | 452 sf | No | Good | 8 | O&M | None |
| M057 Flooring adhesive Black | Below M056 | 452 sf | No | Good | 8 | O&M | None |

Table 3 provides SaLUT's cost estimate for abating (i.e., removing) each ACBM identified in the building. These estimates are conceptual cost estimates based on standard unit rates for different types of ACBM except for very small abatement projects, where the minimum cost is $1,200. Contractor mobilization/demobilization, transportation, disposal, and other miscellaneous costs are included in the unit. Operations and maintenance (O&M) costs are not provided as part of the recommended response cost.

**Table 3. Asbestos Abatement Cost Estimates.**

| Material Type | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|
| First Floor | | | | |
| FM1 Black mastic | Below FT1 (Hallways 125-127, Rooms 106, 110, 112, 115, 119, 145, 155, 161, 161B, 165-168) | 4,446 sf | 3 | $$13,338 |
| FM2 Black mastic | Below FT2 | 1,858 sf | 3 | 5,574 |
| FM3 Black mastic | Below FT3 (Room 162) | 1,397 sf | 3 | 4,191 |

| Material Type | | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|---|
| FM4 | Black mastic | Below FT4 (Room 162) | 1,397 sf | 3 | 4,191 |
| FM6 | Black/amber mastic | Below FT6 (Rooms 101, 107, 111, 113, 114) | 750 sf | 3 | 2,250 |
| FM10 | Black/amber mastic | Below FT10 (Room 105) | 160 sf | 3 | 480 |
| FM11 | Black/amber mastic | Below FT11 (Rooms 117, 119, 159) | 1,302 sf | 3 | 3,906 |
| FM16 | Black mastic (same as Baker's M002) | Below FT16 (Rooms 107, 164, 165, 166, 167, 179) | 1,087 sf | 3 | 3,261 |
| FM17 | Black mastic (same as Baker's M013) | Rooms 110, 111, 112, 113, 168 | 952 sf | 3 | 2,856 |
| FT2 | 12" x 12" white floor tile with brown streaks | Rooms 108, 109, 122, 140, 156, 164 | 1,434 sf | 5 | 7,170 |
| FT3 | 4" x 12" green floor tile with white streaks | Room 162 | 1,397 sf | 5 | 6,985 |
| FT16 | 12" x 12" olive floor tile (same as Baker's M001) | Rooms 107, 164, 165, 166, 167, 179 | 1,087 sf | 5 | 5,435 |
| FT17 | 12" x 12" cream floor tile (same as Baker's M012) | Rooms 110, 111, 112, 113, 168 | 952 sf | 5 | 4,760 |
| M008 | 12" x 12" floor tile Beige | Rooms 104, 113, 145, 155, 156, 169-175, 180 | 2,154 sf | 5 | 10,770 |
| M009 | Flooring adhesive Black | Below M008 | 2,154 sf | 3 | 6,462 |
| M010 | 9" x 9" Floor Tile Black | Room 103 | 364 sf | 5 | 1,820 |
| M011 | Flooring adhesive Black | Below M010 | 364 sf | 3 | 1,092 |
| Second Floor | | | | | |
| FM18 | Black mastic | Below FT18 | 6,236 sf | 3 | 18,708 |
| FM19 | Black mastic | Below FT19 (Rooms 200, 203, 208-217, 219, 220, 222, 225, 229-240, 262, 263, 267-270, 272-276) | 9,242 sf | 3 | 27,726 |
| FT18 | 12"x12" olive floor tile (same as Baker's M027) | Rooms 205-207, 226-228, 243-245, 263-266, 276, 277, 288, 289) | 6,236 sf | 5 | 31,180 |
| M035 | 12 x 12 floor tile White with gray | Room 277 | 290 sf | 5 | 1,450 |
| M036 | Flooring adhesive Black | Below M035 | 290 sf | 3 | 870 |
| Third Floor | | | | | |
| FM8 | Black mastic | Below FT8 | 3,952 sf | 3 | 11,856 |
| FM21 | Black mastic | Below FT21 | 9,935 sf | 3 | 29,805 |
| FT8 | 12" x 12" olive/tan floor tile (same as Baker's M053) | Rooms 304-307, 324, 326-328, 343-345, 359, 362-366, 377, 382- 389 | 3,952 sf | 5 | 19,760 |
| FT21 | 12" x 12" cream floor tile | Rooms 300, 303, 308-317, 319, 320, 322, 325, 329-342, 346-355, 357, 360, 369-376 | 9,935 sf | 5 | 49,675 |
| M056 | 12 x 12 floor tile Green | Room 365 | 452 sf | 5 | 2,260 |
| M057 | Flooring adhesive Black | Below M056 | 452 sf | 3 | 1,356 |
| Total abatement cost | | | | | $256,084 |

**Analytical Laboratory Sample Results**
**And**
**Chains of Custody**

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Schofield Barracks, BLDG 358 - Quad C
Client: SALUT
Project #: 01-290
Sampled by: JSW
Sample Date: 03/07/02
Turn Around Time: ~~[illegible]~~ Rush
030702-

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|
| 030702-358-JSW-B182 | 1st FLR, Rm 116 Boiler Rm | ↓ | | | | | | |
| B183 | | ↓ | | | | | | |
| B184 | | ↓ | | | | | | |

* Note:
Just the wrap - not the yellow fiberglass insulation

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| John Willard | J. Bradley | |
| Signature: | Signature: | Signature: |
| Time/Date: 03-07-02 | Time/Date: 3/7/02 | Time/Date: |

pg 2 of 2

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

022202-

# CHAIN OF CUSTODY

Project Name: SB, BLDG 358 - Quad C
Client
Project #
Sampled by:
Sample Date: 02/19/02
Turn Around Time:

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 27 021902-358-JSW-B180 | 1st FLR, Rm 104 | I | | | | | | | |
| 28 " B181 | " Rm 134 | | | | | | | | |

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 @ 0900 | Time/Date: | Time/Date: |

pg 1 of 2

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

022202

# CHAIN OF CUSTODY

Project Name: Schofield Barracks, BLDG 358 - Quadc
Client: SALUT
Project # 01-290
Sampled by: JSW
Sample Date: 02/19/02
Turn Around Time: ~~5 DAY~~ 3 Day

ANALYSIS REQUESTED

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| 021902-17 | 358 - JSW - B170 | 2nd FLR, HW 264 | | | | | | | | |
| 18 | B171 | HW 287 | | | | | | | | |
| 19 | B172 | HW 206 | | | | | | | | |
| 20 | B173 | 3rd FLR, HW 305 | | | | | | | | |
| 21 | B174 | HW 326 | | | | | | | | |
| 22 | B175 | HW 365 | | | | | | | | |
| 23 | B176 | 1st FLR, HW 148 | | | | | | | | |
| 24 | B177 | HW 105 | | | | | | | | |
| 25 | B178 | HW 165 | | | | | | | | |
| 26 | B179 | Rm 157 | | | | | | | | |

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 @ 10am | Time/Date: | Time/Date: |

WEC WHITE ENVIRONMENTAL CONSULTANTS INC

2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks, BLDG 358 - Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: [illegible] |
| Date: 01-23-02 | Date: 01-23-02 @ 12:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)

**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)

**TCLP for Lead** (SW 846-1311) **OTHER (specify analysis and method below)**

Turn-around Time: RUSH 24 48 72 HOUR

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 012302-358-WOR | B167 | 1st FLR, Rm 162 | 23 Jan 02 | | |
| | B168 | | | | |
| | B169 | 2nd FLR, Rm 221 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
QAC Initials GCS
G. Slaugenhoup Rev B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Sal UT | Project Name: Schofield Barracks, Quad C, Bldg 358 |
| Project Number: 01-290 Schofield | |
| Samples Relinquished by: Tina Perry-Finn | Sample Received by: R Hamasaki 浜崎 |
| Date: 1/10/02 | Date: 01-10-02 @ 11:15 am Thrs. |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis:** ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
**LEAD:** Air (NIOSH 7400) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 010802-358-JMU- | B 153 | RM 365 | 01-0802 | accepted | |
| | B 154 | RM 327 | | | |
| | B 155 | RM 345 | | | |
| | B 156 | RM 243 | | | |
| | B 157 | RM 265 | | | |
| | B 158 | RM 226 | | | |
| | B 159 | RM 140 | | | |
| | B 160 | RM 162 | | | |
| | B 161 | RM 162 | | | |
| | B 162 | RM 179 | | | |
| | B 163 | RM 168 | | | |
| | B 164 | RM 126 | | | |
| | B 165 | RM 106 | | | |
| | B 166 | RM 151 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
QAC Initials GLS
G. Slaughoup Rev B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-19-01 9:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 121301-358-JMV | B145 | 2nd FLR, Rm 265 | 13 Dec 01 | | |
| | B146 | 266 | | | |
| | B147 | 288 | | | |
| | B148 | 288 | | | |
| | B149 | 264 | | | |
| | B150 | 3rd FLR, Rm 376 | | | |
| | B151 | 373 | | | |
| | B152 | 368 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method. Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
QAC Initials GLS
G. Slaugenhaup Rev. D

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: Tina Perry-Lucas | Sample Received by: S. Santos |
| Date: 12/19/01 | Date: 12.19.01 9:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1311) **OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121301-358-JMV | B130 | 1st FLR, Rm 179 | 13 Dec 01 | Accept | |
| | B131 | 179 | | | |
| | B132 | 179 | | | |
| | B133 | 179 | | | |
| | B134 | 168 | | | |
| | B135 | 168 | | | |
| | B136 | 2nd FLR, Rm 266 | | | |
| | B137 | 276 | | | |
| | B138 | 275 | | | |
| | B139 | 275 | | | |
| | B140 | 275 | | | |
| | B141 | 272 | | | |
| | B142 | 273 | | | |
| | B143 | 271 | | | |
| | B144 | 270 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request:



QAC Initials [illegible] 463
G. Slaugenhoup Rev. B

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: Tim Perry-Finn | Sample Received by: K-Santos |
| Date: 12/12/01 | Date: 12/12/01 @ 10:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121101-358-JMV | B127 | Boiler Rm, 1st Flr | 11 Dec 01 | accepted | 72 Hr. |
| ↓ | B128 | ↓ | ↓ | ↓ | ↓ |
| | B129 | | | | |
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*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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G. Slangerhoup Rev. B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 12/7/01 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**
RUSH
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 1207-358-JMV | B126 | 3rd FLR, Rm 345 | 7 Dec 01 | accepted | 72 HR |
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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358 Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 12-7-01 @ 2:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**
RUSH
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 120701-358-JMV | B111 | 2nd FLR, Rm 245 | 7 Dec 01 | accepted | 72 HR |
| | B112 | 3rd FLR, Rm 344 | | | |
| | B113 | " Rm 349 | | | |
| | B114 | " Rm 354 | | | |
| | B115 | " " " | | | |
| | B116 | " " " | | | |
| | B117 | " " " | | | |
| | B118 | " " " | | | |
| | B119 | " Rm 355 | | | |
| | B120 | " Rm 359 | | | |
| | B121 | " " " | | | |
| | B122 | " " " | | | |
| | B123 | " " " | | | |
| | B124 | " Rm 357 | | | |
| | B125 | " Rm 356 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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WEC WHITE ENVIRONMENTAL CONSULTANTS INC

2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 358, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 12-7-01 @ 2:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 120701-358-JMV | B96 | 1st FLR, Rm 146 | 7 Dec 01 | accepted | 72 HR |
| | B97 | " Rm 148 | | | |
| | B98 | " Rm 142 | | | |
| | B99 | " Rm 142 | | | |
| | B100 | " Rm 148 | | | |
| | B101 | 2nd FLR, Rm 244 | | | |
| | B102 | " " | | | |
| | B103 | " " | | | |
| | B104 | " " | | | |
| | B105 | " Rm 250 | | | |
| | B106 | " Rm 251 | | | |
| | B107 | " Rm 259 | | | |
| | B108 | " Rm 244 | | | |
| | B109 | " Rm 259 | | | |
| | B110 | " Rm 256 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.

Client correspondence regarding acceptance criteria or other aspects of analytical request:



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WEC WHITE ENVIRONMENTAL CONSULTANTS INC

2290 Atahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 358 |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: |
| Date: 12-6-01 | Date: |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403) Soil (846-3050A)
LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420)
TCLP for Lead (SW 846-1311) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 120601-358-JMV | B93 | RM 306 3rd Floor | 12-6-01 | accepted | 72 HR |
| " " " | B94 | RM 318 ↓ | | | |
| " " " | B95 | RM 327 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 558 |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: 12-6-01 | Date: 12-7-01 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 120601-358-JMV- | B 78 | RM 117 1st Floor | 120601 | accepted | |
| | B 79 | RM 117 " | | | 72 HR |
| | B 80 | Rm 205 2nd Floor | | | |
| | B 81 | Rm 205 | | | |
| | B 82 | RM 206 | | | |
| | B 83 | RM 217 | | | |
| | B 84 | Rm 207 | | | |
| | B 85 | Rm 207 | | | |
| | B 86 | Rm 207 | | | |
| | B 87 | Rm 207 | | | |
| | B 88 | Rm 218 | | | |
| | B 89 | RM 221 | | | |
| | B 90 | RM 317 3rd Floor | | | |
| | B 91 | Rm 307 | | | |
| | B 92 | RM 306 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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[illegible]/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield barrack Bldg 358 |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: John Veitch | Sample Received by: K. Santos |
| Date: 12 0601 | Date: 12/7/01 @ 2:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**
RUSH
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 120601-358-JMV | B63 | RM 106, 1st Floor | 120601 | accepted | |
| | B64 | RM 101 | | | |
| | B65 | RM 101 | | | 72 Hr |
| | B66 | RM 114 | | | |
| | B67 | RM 101 | | | |
| | B68 | RM 101 | | | |
| | B69 | RM 104 | | | |
| | B70 | RM 104 | | | |
| | B71 | RM 108 | | | |
| | B72 | RM 105 | | | |
| | B73 | RM 111 | | | |
| | B74 | RM 105 | | | |
| | B75 | RM 105 | | | |
| | B76 | RM 105 | | | |
| | B77 | RM 117 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SeLoT | Project Name: Quad C Schofield Barracks |
| Project Number: 01-290, Bldg # 358 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: 12-3-01 | Date: 12/5/01 @ 9:30 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 120301-358-IMO | B50 | Rm 140 | 12-3-01 | | 72 hour |
| | B51 | Rm 140 | | | |
| | B52 | Rm 134 | | | |
| | B53 | Rm 125 | | | |
| | B54 | Rm 122 | | | |
| | B55 | Rm 122 | | | |
| | B56 | Rm 122 | | | |
| | B57 | Rm 122 | | | |
| | B58 | Rm 122 | | | |
| | B59 | Rm 122 | | | |
| | B60 | Rm 122 | | | |
| | B61 | Rm 122 | | | |
| | B62 | Rm 122 | | | |
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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
QAC Initials GLS
G. Slaugenhoup

WEC WHITE ENVIRONMENTAL CONSULTANTS, INC.
2290 Aiahio Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SCLUT | Project Name: Quad C Schofield Barracks |
| Project Number: 01-290 - Bldg # 358 | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: 12-3-01 | Date: 12/5/01 @ 9:30 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 120301-358-IAQ | B35 | Rm 239 | 12-3-01 | A | 72 hour |
| | B36 | Rm 234 | | | |
| | B37 | Rm 232 | | | |
| | B38 | Rm 229 | | | |
| | B39 | Rm 226 | | | |
| | B40 | Rm 226 | | | |
| | B41 | Rm 339 | | | |
| | B42 | Rm 327 | | | |
| | B43 | Rm 340 | | | |
| | B44 | Rm 384 | | | |
| | B45 | Rm 384 | | | |
| | B46 | Rm 127 | | | |
| | B47 | Rm 127 | | | |
| | B48 | Rm 126 | | | |
| | B49 | Rm 140 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Atahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: | Sample Received by: G. Santos |
| Date: 12-3-01 | Date: 12-03-01 10:45 am |
| Samples Relinquished by: J. Willard | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 113001-358-JMV | B31 | RM 365, Above Ceiling | 11-30-01 | | |
| " " " | B32 | RM 365 | ↓ | | |
| " " " | B33 | RM 162 (Tile and Mastic) | | | |
| " " " | B34 | RM 162 (Tile and Mastic) | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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QAC Initials GGS
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WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahea Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: 01-290 Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: 12-3-01 | Date: 12-03-01 10:45am |
| Samples Relinquished by: J. Willard | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 113001-358-JMV | B16 | RM 277 | 11-30-01 | | |
| | B17 | RM 277 | | | |
| | B18 | RM 277 | | | |
| | B19 | RM 279 | | | |
| | B20 | RM 275 | | | |
| | B21 | RM 275 | | | |
| | B22 | RM 265 | | | |
| | B23 | RM 366 | | | |
| | B24 | RM 381 | | | |
| | B25 | RM 372 | | | |
| | B26 | RM 365 | | | |
| | B27 | RM 362 | | | |
| | B28 | RM 362 | | | |
| | B29 | RM 365 | | | |
| | B30 | RM 365 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
QAC Initials GLS
G. Slangenhoup Rev. B
10/15/01

DEC-03-2001 08:19AM FROM-WHITE ENVIRONMENTAL CONSULTANTS 8088430657 T-586 P 002/002 F-036

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Sa LUT | Project Name: 01-290 Schofield Barracks |
| Project Number: 01-290, Building 358 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: 12-3-01 | Date: 12-03-01 10:46am |
| Samples Relinquished by: J. Willard | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Due Thursday, 10:45AM

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample Code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 113001-358-JMV | B1 | RM 175 | 11-30-01 | | |
| " " " | B2 | RM 175 | | | |
| | B3 | RM 167 | | | |
| | B4 | RM 169 | | | |
| | B5 | RM 166 | | | |
| | B6 | RM 169 | | | |
| | B7 | RM 168 (Floor Tile) | | | |
| | B8 | RM 164 (Floor Tile) | | | |
| | B9 | RM 164 (Mastic) | | | |
| | B10 | RM 162 (Tile + Mastic) | | | |
| | B11 | RM 162 | | | |
| | B12 | RM 162 | | | |
| | B13 | 2nd Floor Hallway, Rear Door | | | |
| | B14 | RM 265 | | | |
| | B15 | RM 277 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
QAC Initials GLS
G. Slangenhoup Rev. B
10/15/01

DEC-03-2001 08:19AM FROM-WHITE ENVIRONMENTAL CONSULTANTS 8088430657 T-586 P 002/002 F-036

Globeteck NVLAP
NVLAP ID# 200541-0
544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

Analyst: _____

for Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report s only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were d. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

Globeteck NVLAP NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name:*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** W. Bradley
***TAT:*** Rush
***Report No:*** 222
***Date Printed:*** 3/8/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 3 ***Total # of Layer(s):*** 3

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-358-JSW-B182 | 030702-03 | 3/7/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Rm 116, Boiler Rm **Materials:** White Cloth with Metal Foil

**Other Fibrous Materials:** Fibrous Glass 10-20%

**Non-Fibrous Materials:** Metal Foil, Paint, Glue/Binder

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-358-JSW-B183 | 030702-04 | 3/7/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Rm 116, Boiler Rm **Materials:** White Cloth with Metal Foil

**Other Fibrous Materials:** Cellulose 3-5%, Fibrous Glass 10-20%

**Non-Fibrous Materials:** Metal Foil, Paint, Glue/Binder

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-358-JSW-B184 | 030702-05 | 3/7/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Rm 116, Boiler Rm **Materials:** White Cloth with Metal Foil

**Other Fibrous Materials:** Cellulose 3-5%, Fibrous Glass 10-20%

**Non-Fibrous Materials:** Metal Foil, Paint, Glue/Binder

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B178 | 022202-25 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 165 **Materials:** Granular Matrix

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B179 | 022202-26 | 2/22/02 | 1 of 1 | Chrysotile | White | <1% |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 151 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 5-10% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B180 | 022202-27 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 104 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 20-40%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B181 | 022202-28 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 134 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

**Analyst:** _____

for Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report s only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were c ed. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B173 | 022202-20 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 3rd Flr, Hw 305 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 20-30%, Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B174 | 022202-21 | 2/22/02 | 1 of 1 | Chrysotile | White | <1% |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 3rd Flr, Hw 326 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B175 | 022202-22 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 3rd Flr, Hw 365 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B176 | 022202-23 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 148 **Materials:** Granular Matrix

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B177 | 022202-24 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 1st Flr, Hw 106 **Materials:** Granular Matrix

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** W. Bradley
**TAT:** 3 Days
**Report No:** 187
**Date Printed:** 2/26/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 12 **Total # of Layer(s):** 12

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B170 | 022202-17 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 2nd Flr, Hw 264 **Materials:** White Chalky Material W/Paper
**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%
**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B171 | 022202-18 | 2/22/02 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 2nd Flr, Hw 287 **Materials:** Chalky Material w/Paint
**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%
**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-358-JSW-B172 | 022202-19 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 358, Quad C **Location:** 2nd Flr, Hw 206 **Materials:** White Composite Dry Wall Material
**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%
**Non-Fibrous Materials:** Gypsum/Binder, Mica, Calcite

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-086
**Client Project#:** 01-290

**Report #:** 11132
**Report Date:** 1/23/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-358-KWR-B168 | HB02-301 | 1st Fl. Rm.162 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Green |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos: None***

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-358-KWR-B169 | HB02-302 | 2nd Fl. Rm.221 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 1/23/02

**QC** [signature] **Date** 1/23/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-086
**Client Project#:** 01-290

**Report #:** 11132
**Report Date:** 1/23/2002

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 2 **# Layers:** 3

**Collected Date:** 1/23/2002
**Collected By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/23/2002
**Received By:** R.Hamasaki
**Received Date:** 1/23/2002

**Project Name/Location:** Schofield Barracks Quad C Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-358-KWR-B167 | HB02-300A | 1st. Fl. Rm.162 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | green |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-358-KWR-B167 | HB02-300B | 1st Fl. Rm.162 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 91%***

**Sample Comments:** Client requested if Pos. to stop

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-086
**Client Project#:** 01-290

**Report #:** 11002
**Report Date:** 1/16/02

Comments:

**Analyst** Shd Wells **Date** 1/16/02
**QC** [illegible] **Date** 1/16/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-086
Client Project#: 01-290

Report #: 11002
Report Date: 1/16/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B164 | HB02-0127 | Room 126 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B165 | HB02-0128 | Room 106 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B166 | HB02-0129 | Room 151 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-086
Client Project#: 01-290

Report #: 11002
Report Date: 1/16/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B162 | HB02-0125-B | Room 179 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 4%

**% Non Fibrous Materials: 92%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B163 | HB02-0126-A | Room 168 | 1 of 2 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Brown |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B163 | HB02-0126-B | Room 168 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 2%

*% Other Fibrous Materials:* 4%

**% Non Fibrous Materials: 94%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-086
Client Project#: 01-290

Report #: 11002
Report Date: 1/16/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B160 | HB02-0123 | Room 162 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B161 | HB02-0124 | Room 162 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B162 | HB02-0125-A | Room 179 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Drk. Olive Grn. |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-086
Client Project#: 01-290

Report #: 11002
Report Date: 1/16/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B158 | HB02-0121 | Room 226 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B159 | HB02-0122-A | Room 140 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B159 | HB02-0122-B | Room 140 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-086
Client Project#: 01-290

Report #: 11002
Report Date: 1/16/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B155 | HB02-0118 | Room 345 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B156 | HB02-0119 | Room 243 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B157 | HB02-0120 | Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-086
**Client Project#:** 01-290

**Report #:** 11002
**Report Date:** 1/16/02

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 14 **# Layers:** 17

**Collected Date:** 1/8/02
**Collected By:** Client
**TAT:** One week (or more
**Analysis By:** S. Wells
**Analysis Date:** 1/16/02
**Received By:** Hamasaki, R.
**Received Date:** 1/10/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B153 | HB02-0116 | Room 365 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-358-JMV-B154 | HB02-0117 | Room 327 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B151 | HB01-3849-B | 3rd Floor Room 373 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *5%*

***% Non Fibrous Materials:* *91%***

**Sample Comments:**

Comments:

**Analyst** Shao Wells **Date** 12/21/01

**QC** [signature] **Date** 12/24/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B150 | HB01-3848-A | 3rd Floor Room 376 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials:** *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B150 | HB01-3848-B | 3rd Floor Room 376 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials:* *5%*

**% Non Fibrous Materials:** *91%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B151 | HB01-3849-A | 3rd Floor Room 373 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials:** *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B148 | HB01-3846 | 2nd Floor Room 288 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | Yes | Adhesive | Cream |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B149 | HB01-3847-A | 2nd Floor Room 264 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B149 | HB01-3847-B | 2nd Floor Room 264 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***

***% Non Fibrous Materials: 98%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10641
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B146 | HB01-3844-A | 2nd Floor Room 266 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B146 | HB01-3844-B | 2nd Floor Room 266 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials: 10%*

***% Non Fibrous Materials: 86%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B147 | HB01-3845 | 2nd Floor Room 288 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | Yes | Adhesive | White |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10641
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B144 | HB01-3842-B | 2nd Floor Room 270 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials: 91%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B145 | HB01-3843-A | 2nd Floor Room 265 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* 0%

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B145 | HB01-3843-B | 2nd Floor Room 265 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials: 91%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B142 | HB01-3840 | 2nd Floor Room 273 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *75%*

***% Non Fibrous Materials:*** ***25%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B143 | HB01-3841 | 2nd Floor Room 271 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *75%*

***% Non Fibrous Materials:*** ***25%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B144 | HB01-3842-A | 2nd Floor Room 270 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |
| Wollastonite | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B140 | HB01-3838-B | 2nd Floor Room 275 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:*** ***97%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B141 | HB01-3839-A | 2nd Floor Room 272 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B141 | HB01-3839-B | 2nd Floor Room 272 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 6% |

*% Other Fibrous Materials:* *6%*

***% Non Fibrous Materials:*** ***90%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B139 | HB01-3837-A | 2nd Floor Room 275 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B139 | HB01-3837-B | 2nd Floor Room 275 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B140 | HB01-3838-A | 2nd Floor Room 375 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B137 | HB01-3835-A | 2nd Floor Room 276 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B137 | HB01-3835-B | 2nd Floor Room 276 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

*% Asbestos:* *6%*

*% Other Fibrous Materials:* *6%*

*% Non Fibrous Materials:* *88%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B138 | HB01-3836 | 2nd Floor Room 275 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:** No mastic on tile.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B135 | HB01-3833 | 1st Floor Room 168 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

***% Asbestos:*** ***Trace***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:** <1% Chrysotile asbestos detected in tile. No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B136 | HB01-3834-A | 2nd floor Room 266 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B136 | HB01-3834-B | 2nd Floor Room 266 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 7% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

***% Asbestos:*** ***5%***

***% Other Fibrous Materials:*** ***7%***

***% Non Fibrous Materials:*** ***88%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B133 | HB01-3831-B | 1st Floor Room 179 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials: 91%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B134 | HB01-3832-A | 1st Floor Room 168 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

**Sample Comments:** <1% Chrysotile asbestos detected in floortile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B134 | HB01-3832-B | 1st Floor Room 168 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 3%

**% Non Fibrous Materials: 93%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B131 | HB01-3829 | 1st Floor Room 179 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *75%*

***% Non Fibrous Materials:*** ***25%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B132 | HB01-3830 | 1st Floor Room 179 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *75%*

***% Non Fibrous Materials:*** ***25%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B133 | HB01-3831-A | 1st Floor Room 179 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10641
**Report Date:** 12/24/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 22 **# Layers:** 36

**Collected Date:** 12/13/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/21/01
**Received By:** S.Santos
**Received Date:** 12/19/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B130 | HB01-3828-A | 1st Floor Room 179 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-358-JMV-B130 | HB01-3828-B | 1st Floor Room 179 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

***% Asbestos:*** ***4%***

***% Other Fibrous Materials:*** ***5%***

***% Non Fibrous Materials:*** ***91%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10411
**Report Date:** 12/13/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-358-JMV-B129 | HB01-3680 | 1st Floor Boiler Room | 1 of 1 |

**Asbestos**

| None Detected | Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|---|
| | Non Friable | Yes | No | Plaster | Grey/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 12/12/01

**QC** [signature] **Date** 12/13/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10411
**Report Date:** 12/13/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 3 **# Layers:** 3

**Collected Date:** 12/11/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/12/01
**Received By:** Santos, K.
**Received Date:** 12/12/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-358-JMV-B127 | HB01-3678 | 1st Floor Boiler Room | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121101-358-JMV-B128 | HB01-3679 | 1st Floor Boiler Room | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B125 | HB01-3541 | 3rd Floor Room 356 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B126 | HB01-3542 | 3rd Floor Room 345 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Off-White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 12/11/01

**QC** [signature] **Date** 12/11/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B123 | HB01-3539 | 3rd Floor Room 359 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 55% |

*% Other Fibrous Materials:* *75%*

***% Non Fibrous Materials:* *25%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B124 | HB01-3540-A | 3rd Floor Room 357 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B124 | HB01-3540-B | 3rd Floor Room 357 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 6% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *6%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials:* *5%*

***% Non Fibrous Materials:* *89%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B120 | HB01-3536 | 3rd Floor Room 359 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/Silver |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 4% |

***% Asbestos:* 0%**

***% Other Fibrous Materials:* 24%**

***% Non Fibrous Materials:* 76%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B121 | HB01-3537 | 3rd Floor Room 359 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

***% Asbestos:* 0%**

***% Other Fibrous Materials:* 80%**

***% Non Fibrous Materials:* 20%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B122 | HB01-3538 | 3rd Floor Room 359 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 55% |

***% Asbestos:* 0%**

***% Other Fibrous Materials:* 75%**

***% Non Fibrous Materials:* 25%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10367
Report Date: 12/11/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B117 | HB01-3533 | 3rd Floor Room 354 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *80%*

*% Non Fibrous Materials:* *20%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B118 | HB01-3534 | 3rd Floor Room 354 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile Mastic | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *80%*

*% Non Fibrous Materials:* *20%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B119 | HB01-3535 | 3rd Floor Room 355 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/Silver |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 5% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *30%*

*% Non Fibrous Materials:* *70%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B115 | HB01-3531-A | 3rd Floor Room 354 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Rust |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 4% |
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *6%*

*% Non Fibrous Materials:* *94%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B115 | HB01-3531-B | 3rd Floor Room 354 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Rust |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 96% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *96%*

*% Non Fibrous Materials:* *4%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B116 | HB01-3532 | 3rd Floor Room 354 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 55% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *80%*

*% Non Fibrous Materials:* *20%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B112 | HB01-3528 | 3rd Floor Room 344 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B113 | HB01-3529 | 3rd Floor Room 349 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Tan |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 99%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B114 | HB01-3530 | 3rd Floor Room 354 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/ Silver |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 4% |

***% Other Fibrous Materials: 29%***

***% Non Fibrous Materials: 71%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B110 | HB01-3526 | 2nd Floor Room 256 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B111 | HB01-3527-A | 2nd Floor Room 245 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B111 | HB01-3527-B | 2nd Floor Room 245 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10367
Report Date: 12/11/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B108 | HB01-3524 | 2nd Floor Room 244 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Yellow |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |
| Synthetic | 2% |

*% Other Fibrous Materials: 4%*

*% Non Fibrous Materials: 96%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B109 | HB01-3525-A | 2nd Floor Room 259 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Mud Comp | White |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 98%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B109 | HB01-3525-B | 2nd Floor Room 259 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Drywall | White/Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 4% |
| Cellulose | 28% |

*% Other Fibrous Materials: 32%*

*% Non Fibrous Materials: 68%*

Sample Comments:

WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl., Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10367
Report Date: 12/11/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B105 | HB01-3521 | 2nd Floor Room 250 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *28%*

*% Non Fibrous Materials:* *72%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B106 | HB01-3522 | 2nd Floor Room 251 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 4% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *29%*

*% Non Fibrous Materials:* *71%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B107 | HB01-3523 | 2nd Floor Room 259 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *28%*

*% Non Fibrous Materials:* *72%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B103 | HB01-3519-B | 2nd Floor Room 244 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Drywall | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 4% |
| Cellulose | 20% |

*% Other Fibrous Materials:* *24%*

***% Non Fibrous Materials:* *76%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B104 | HB01-3520-A | 2nd Floor Room 244 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 3% |
| Cellulose | 1% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B104 | HB01-3520-B | 2nd Floor Room 244 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 96% |

*% Other Fibrous Materials:* *96%*

***% Non Fibrous Materials:* *4%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10367
Report Date: 12/11/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B101 | HB01-3517 | 2nd Floor Room 244 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B102 | HB01-3518 | 2nd Floor Room 244 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos: 0%***

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B103 | HB01-3519-A | 2nd Floor Room 244 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Mud Comp. | White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

***% Asbestos: 0%***

***% Other Fibrous Materials: 3%***

***% Non Fibrous Materials: 97%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B99 | HB01-3515-A | 1st Floor Room 142 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 3% |
| Cellulose | 2% |

*% Other Fibrous Materials:* *5%*

***% Non Fibrous Materials:* *95%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B99 | HB01-3515-B | 1st Floor Room 142 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Rust |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 97% |

*% Other Fibrous Materials:* *97%*

***% Non Fibrous Materials:* *3%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B100 | HB01-3516 | 1st Floor Room 148 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B97 | HB01-3513-A | 1st. Floor Room 148 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B97 | HB01-3513-B | 1st Floor Room 148 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Yellow |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B98 | HB01-3514 | 1st Floor Room 142 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 5% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***30%***

***% Non Fibrous Materials:*** ***70%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10367
**Report Date:** 12/11/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 31 **# Layers:** 40

**Collected Date:** 12/7/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/10/01
**Received By:** Santos, K.
**Received Date:** 12/7/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B96 | HB01-3512-A | 1st Floor Room 146 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

***% Asbestos:*** ***0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B96 | HB01-3512-B | 1st Floor Room 146 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Yellow |

***% Asbestos:*** ***0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B94 | HB01-3578 | 3rd Floor Room 318 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos:* 0%

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* 2%

*% Non Fibrous Materials:* 98%

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B95 | HB01-3579 | 3rd Floor Room 321 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 0%

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* 2%

*% Non Fibrous Materials:* 98%

**Sample Comments:**

Comments:

Analyst [signature] Date 12/12/01

QC [signature] Date 12/12/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B91 | HB01-3575-B | 3rd Floor Room 317 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Mud Comp | White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:** Mud compound on back of adhesive.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B92 | HB01-3576 | 3rd Floor Room 306 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |
| Synthetic | *Trace* |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B93 | HB01-3577 | 3rd Floor Room 306 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 14% |
| Synthetic | 2% |

*% Other Fibrous Materials:* *16%*

***% Non Fibrous Materials:* *84%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B90 | HB01-3574-A | 3rd Floor Room 317 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B90 | HB01-3574-B | 3rd Floor Room 317 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | Yes | Mastic | Yellow |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B91 | HB01-3575-A | 3rd Floor Room 317 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Tan |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 99%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10381
Report Date: 12/12/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B87 | HB01-3571 | 2nd Floor Room 207 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials: 4%*

***% Non Fibrous Materials: 96%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B88 | HB01-3572 | 2nd Floor Room 218 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B89 | HB01-3573 | 2nd Floor Room 221 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B84 | HB01-3568 | 2nd Floor Room 207 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 26% |
| Cellulose | 5% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***31%***

***% Non Fibrous Materials:*** ***69%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B85 | HB01-3569 | 2nd Floor Room 207 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 6% |
| Cellulose | 15% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***21%***

***% Non Fibrous Materials:*** ***79%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B86 | HB01-3570 | 2nd Floor Room 207 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 28% |
| Cellulose | 50% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***78%***

***% Non Fibrous Materials:*** ***22%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10381
Report Date: 12/12/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B81 | HB01-3565 | 2nd Floor Room 205 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 29% |
| Cellulose | 50% |

*% Other Fibrous Materials:* *79%*

***% Non Fibrous Materials:* *21%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B82 | HB01-3566 | 2nd Floor Room 206 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 12% |
| Synthetic | *Trace* |

*% Other Fibrous Materials:* *12%*

***% Non Fibrous Materials:* *88%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B83 | HB01-3567 | 2nd Floor Room 217 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 14% |

*% Other Fibrous Materials:* *14%*

***% Non Fibrous Materials:* *86%***

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B79 | HB01-3563-A | 1st Floor Room 117 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B79 | HB01-3563-B | 1st Floor Room 117 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Amber |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *10%*

*% Non Fibrous Materials:* *86%*

**Sample Comments:** Black mastic mixed with small amount of amber mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B80 | HB01-3564 | 2nd Floor Room 205 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials:* *100%*

**Sample Comments:** No mastic on tile.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B77 | HB01-3561-B | 1st Floor Room 117 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 1% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

***% Asbestos:*** ***Trace***

***% Other Fibrous Materials:*** ***10%***

***% Non Fibrous Materials:*** ***89%***

**Sample Comments:** Amber mastic mixed with black mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B78 | HB01-3562-A | 1st Floor Room 117 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B78 | HB01-3562-B | 1st Floor Room 117 | 2 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Amber |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***4%***

***% Non Fibrous Materials:*** ***96%***

**Sample Comments:** No black mastic on tile.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B76 | HB01-3560-A | 1st Floor Room 105 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B76 | HB01-3560-B | 1st Floor Room 105 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

***% Asbestos: Trace***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 8% |

***% Other Fibrous Materials: 8%***

***% Non Fibrous Materials: 91%***

**Sample Comments:** Amber mastic mixed with black mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B77 | HB01-3561-A | 1st Floor Room 117 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10381
Report Date: 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B74 | HB01-3558 | 1st Floor Room 105 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B75 | HB01-3559-A | 1st Floor Room 105 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B75 | HB01-3559-B | 1st Floor Room 105 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

***% Asbestos: Trace***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 8% |

***% Other Fibrous Materials: 8%***

***% Non Fibrous Materials: 91%***

**Sample Comments:** Amber mastic mixed with black mastic.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B71 | HB01-3555-B | 1st Floor Room 108 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* *5%*

*% Other Fibrous Materials:* *10%*

***% Non Fibrous Materials:* *85%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B72 | HB01-3556 | 1st Floor Room 105 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 28% |
| Cellulose | 50% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *78%*

***% Non Fibrous Materials:* *22%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B73 | HB01-3557 | 1st Floor Room 111 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 4% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *29%*

***% Non Fibrous Materials:* *71%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B69 | HB01-3553 | 1st Floor Room 104 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* 99%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B70 | HB01-3554 | 1st Floor Room 104 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Adhesive | Off-White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B71 | HB01-3555-A | 1st Floor Room 108 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* 99%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B66 | HB01-3550-B | 1st Floor Room 114 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

***% Asbestos:*** ***Trace***

***% Other Fibrous Materials:*** ***4%***

***% Non Fibrous Materials:*** ***96%***

**Sample Comments:** Amber mastic mixed with black mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B67 | HB01-3551 | 1st Floor Room 101 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 7% |
| Cellulose | 15% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Brown |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***22%***

***% Non Fibrous Materials:*** ***78%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B68 | HB01-3552 | 1st Floor Room 101 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***29%***

***% Non Fibrous Materials:*** ***71%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B65 | HB01-3549-A | 1st Floor Room 101 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B65 | HB01-3549-B | 1st Floor Room 101 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Amber |

*% Asbestos:* *Trace*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials:* *5%*

***% Non Fibrous Materials:* *94%***

**Sample Comments:** Amber mastic mixed with black mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B66 | HB01-3550-A | 1st Floor Room 114 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10381
**Report Date:** 12/12/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 33 **# Layers:** 43

**Collected Date:** 12/6/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/12/01
**Received By:** Santos, K.
**Received Date:** 12/7/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B63 | HB01-3547 | 1st Floor Room 106 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B64 | HB01-3548 | 1st Floor Room 101 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:** No mastic on tile.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B61 | HB01-3443-A | Room 122 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B63 | HB01-3443-B | Room 122 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 12% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

***% Asbestos: 12%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***

***% Non Fibrous Materials: 86%***

**Sample Comments:**

Comments:

**Analyst** Matt **Date** 12/10/01
**QC** [signature] **Date** 12-11-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B59 | HB01-3441-B | Room 122 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 12% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

**Other Fibrous Materials**

None Detected

*% Asbestos: 12%*

*% Other Fibrous Materials: 0%*

*% Non Fibrous Materials: 88%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B60 | HB01-3442-A | Room 122 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Blue |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B60 | HB01-3442-B | Room 122 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 98%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B58 | HB01-3440-A | Room 122 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B58 | HB01-3440-B | Room 122 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 99%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B59 | HB01-3441-A | Room 122 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Tan |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B56 | HB01-3438-B | Room 122 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Tan |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B57 | HB01-3439-A | Room 122 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Blue |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B57 | HB01-3439-B | Room 122 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

***% Asbestos: 0%***

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 99%***

**Sample Comments:**

WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl., Honolulu, HI 96819-2283
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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B54 | HB01-3436-B | Room 122 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B55 | HB01-3437 | Room 122 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B56 | HB01-3438-A | Room 122 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

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NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B52 | HB01-3434-B | Room 734 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B53 | HB01-3435 | Room 125 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | CB Mastic | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B54 | HB01-3436-A | Room 122 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Blue |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B50 | HB01-3432-B | Room 140 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B51 | HB01-3433 | Room 140 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | CB Mastic | Off White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-1352 | HB01-3434-A | Room 134 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B49 | HB01-3431-A | Room 140 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B49 | HB01-3431-B | Room 140 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B50 | HB01-3432-A | Room 140 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B47 | HB01-3429 | Room 127 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 80% |

*% Other Fibrous Materials:* *95%*

***% Non Fibrous Materials:* *5%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B48 | HB01-3430-A | Room 126 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

**None Detected**

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B48 | HB01-3430-B | Room 126 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B44 | HB01-3426 | Room 384 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B45 | HB01-3427 | Room 384 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | CB Mastic | Off White |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B46 | HB01-3428 | Room 127 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 75% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 95%*

*% Non Fibrous Materials: 5%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B41 | HB01-3423 | Room 339 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile Mastic | Beige |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B42 | HB01-3424 | Room 327 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 80% |

***% Other Fibrous Materials: 95%***

***% Non Fibrous Materials: 5%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B43 | HB01-3425 | Room 340 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Yellow |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 96% |
| Cellulose | 2% |

***% Other Fibrous Materials: 98%***

***% Non Fibrous Materials: 2%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B39 | HB01-3421-A | Room 226 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

*% Non Fibrous Materials:* 98%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B39 | HB01-3421-B | Room 226 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 3%

*% Non Fibrous Materials:* 97%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B40 | HB01-3422 | Room 226 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | CB Mastic | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

*% Non Fibrous Materials:* 99%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#: 01-290

Report #: 10332
Report Date: 12/10/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B36 | HB01-3418 | Room 234 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 70% |

*% Other Fibrous Materials:* *90%*

***% Non Fibrous Materials:*** ***10%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B37 | HB01-3419 | Room 232 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 70% |

*% Other Fibrous Materials:* *90%*

***% Non Fibrous Materials:*** ***10%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B38 | HB01-3420 | Room 229 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 70% |

*% Other Fibrous Materials:* *90%*

***% Non Fibrous Materials:*** ***10%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10332
**Report Date:** 12/10/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 27 **# Layers:** 40

**Collected Date:** 12/3/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** M.White
**Analysis Date:** 12/9/01
**Received By:** Santos, K.
**Received Date:** 12/5/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B35 | HB01-3417-A | Room 239 | 1 of 2 |

**Asbestos**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Brown |

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*
*% Other Fibrous Materials:* *3%*
***% Non Fibrous Materials:*** ***97%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B35 | HB01-3417-B | Room 239 | 2 of 2 |

**Asbestos**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Floor Tile | Beige |

None Detected

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B34 | HB01-3295-A | Room 162 | 1 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Gray/White |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

**Other Fiberous Materials**

None Detected

*% Asbestos:* *Trace*

*% Other Fiberous Materials:* *0%*

*% Non Fiberous Materials:* *100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B34 | HB01-3295-B | Room 162 | 2 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *15%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *85%*

Sample Comments:

Comments:

Analyst [signature] Date 12-06-01

QC [signature] Date 12-06-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B32 | HB01-3293 | Room 365 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Asbestos: 0%*

*% Other Fiberous Materials: 60%*

*% Non Fiberous Materials: 40%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B33 | HB01-3294-A | Room 162 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Green/Wht. |

**Other Fiberous Materials**

None Detected

*% Asbestos: Trace*

*% Other Fiberous Materials: 0%*

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B33 | HB01-3294-B | Room 162 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos: 15%*

*% Other Fiberous Materials: 3%*

*% Non Fiberous Materials: 82%*

Sample Comments:

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NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B29 | HB01-3290 | Room 365 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

**Other Fiberous Materials**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Brown/Tan |

*% Asbestos: Trace*

*% Other Fiberous Materials: 0%*

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B30 | HB01-3291 | Room 365 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 15% |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 15%*

*% Other Fiberous Materials: 3%*

*% Non Fiberous Materials: 82%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B31 | HB01-3292 | Room 365, Above Ceiling | 1 of 1 |

**Asbestos**

None Detected

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 85% |
| Synthetic | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation & Jacket | Silv/Orng. |

*% Asbestos: 0%*

*% Other Fiberous Materials: 90%*

*% Non Fiberous Materials: 10%*

Sample Comments:

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl., Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B26 | HB01-3287 | Room 365 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Tan/Wht/Blk |

**Other Fiberous Materials**

None Detected

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B27 | HB01-3288 | Room 362 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan/Brown |

**Other Fiberous Materials**

None Detected

*% Asbestos: Trace*

*% Other Fiberous Materials: 0%*

*% Non Fiberous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B28 | HB01-3289 | Room 362 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 8% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos: 8%*

*% Other Fiberous Materials: 5%*

*% Non Fiberous Materials: 87%*

Sample Comments:

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2290 Alahao Pl., Honolulu, HI 96819-2283
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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B23 | HB01-3284 | Room 366 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Brwn/Yellow |

**Other Fiberous Materials**

None Detected

***% Non Fiberous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B24 | HB01-3285 | Room 381 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

***% Asbestos: 0%***

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

***% Other Fiberous Materials: 60%***

***% Non Fiberous Materials: 40%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B25 | HB01-3286 | Room 372 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan/White |

***% Asbestos: 0%***

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fiberous Materials: Trace***

***% Non Fiberous Materials: 100%***

**Sample Comments:** No mastic recovered.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B20 | HB01-3281 | Room 275 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B21 | HB01-3282 | Room 275 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Not Specified | Brown |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 30% |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *30%*

*% Non Fiberous Materials:* *70%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B22 | HB01-3283 | Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Tan/Blue |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B17 | HB01-3278 | Room 277 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mortar | Gray/Blue |

**Other Fiberous Materials**

None Detected

***% Non Fiberous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B18 | HB01-3279 | Room 277 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray/White |

***% Asbestos: 0%***

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

***% Other Fiberous Materials: 60%***

***% Non Fiberous Materials: 40%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B19 | HB01-3280 | Room 279 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mortar/Concrete | Gray/Brown |

**Other Fiberous Materials**

None Detected

***% Non Fiberous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:**

**Report #:** 10272
**Report Date:** 12/6/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B14 | HB01-3275 | Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *Trace*

*% Non Fiberous Materials:* *100%*

**Sample Comments:** No mastic recovered.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 357-B15 | HB01-3276 | Room 277 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation Jacket | Silv/Orng. |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 15% |
| Synthetic | 15% |

*% Asbestos:* *0%*

*% Other Fiberous Materials:* *30%*

*% Non Fiberous Materials:* *70%*

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B16 | HB01-3277 | Room 227 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mortar | Gray |

**Other Fiberous Materials**

None Detected

*% Non Fiberous Materials:* *100%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B11 | HB01-3272 | Room 162 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: 0%*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 100%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B12 | HB01-3273 | Room 162 | 1 of 1 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 10%*

*% Other Fiberous Materials: 2%*

*% Non Fiberous Materials: 88%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B13 | HB01-3274 | 2nd Floor Hallway, Near Door | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Yellow |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |
| Synthetic | Trace |

*% Asbestos: 0%*

*% Other Fiberous Materials: Trace*

*% Non Fiberous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:**

**Report #:** 10272
**Report Date:** 12/6/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B9 | HB01-3270 | Room 164 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 80% |

*% Asbestos:* 0%

*% Other Fiberous Materials:* 80%

*% Non Fiberous Materials:* 20%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B10 | HB01-3271-A | Room 162 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 1% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | VC Tile | Green |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* Trace

*% Other Fiberous Materials:* Trace

*% Non Fiberous Materials:* 98%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B10 | HB01-3271-B | Room 162 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 8% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* 8%

*% Other Fiberous Materials:* Trace

*% Non Fiberous Materials:* 91%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B6 | HB01-3267 | Room 169 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Yellow/Wht. |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Synthetic | *Trace* |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials: 100%**

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B7 | HB01-3268 | Room 168 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials: 100%**

**Sample Comments:** No mastic recovered.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B8 | HB01-3269 | Room 164 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | VC Tile | Tan |

*% Asbestos:* *0%*

**Other Fiberous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fiberous Materials:* *Trace*

**% Non Fiberous Materials: 99%**

**Sample Comments:** Analysis on tile only requested.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1203
Client Project#:

Report #: 10272
Report Date: 12/6/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B3 | HB01-3264 | Room 167 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Tan/Gray |

**Other Fiberous Materials**

None Detected

**% Non Fiberous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B4 | HB01-3265 | Room 169 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic,CB | Tan/Brown |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Wollastonite | Trace |

*% Asbestos: 0%*

*% Other Fiberous Materials: Trace*

**% Non Fiberous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B5 | HB01-3266 | Room 166 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fiberous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Asbestos: 0%*

*% Other Fiberous Materials: 60%*

**% Non Fiberous Materials: 40%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1203
**Client Project#:** 01-290

**Report #:** 10272
**Report Date:** 12/6/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 34 **# Layers:** 37

**Collected Date:** 11/30/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** G. Slaugenhou
**Analysis Date:** 12/5/01
**Received By:** S.Santos
**Received Date:** 12/3/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 358

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B1 | HB01-3262 | Room 175 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation & Jacket | Silv/Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 95% |
| Synthetic | 2% |

*% Other Fibrous Materials:* *97%*

*% Non Fibrous Materials:* *3%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 358-B2 | HB01-3263 | Room 175 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *60%*

*% Non Fibrous Materials:* *40%*

**Sample Comments:**

**Laboratory Quality Control Results**
**And**
**Chains of Custody**

**Globeteck** NVLAP® NVLAP ID# 200541-0

**544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987**

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** M. Rouf
***TAT:*** 72 Hours
***Report No:*** 73
***Date Printed*** 1/2/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 1 ***Total # of Layer(s):*** 2

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 12-13-01-358-JMV-B152 | 123101-05 | 1/2/2002 | 1/2/2002 | 1 of 1 | Chrysotile | Beige | 1-3% |

**Project Name:** Schofield Barracks **Location:** 3rd Floor, Room 368 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** Non-Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 12-13-01-358-JMV-B152 | 123101-05 | 1/2/2002 | 1/2/2002 | 1 of 1 | Chrysotile | Black | 3-5% |

**Project Name:** Schofield Barracks **Location:** 3rd Floor, Room 368 **Materials:** Black Mastic

**Other Fibrous Materials:** Non-Detected
**Non-Fibrous Materials:** Asphalt/Binder

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report s only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were d. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** G. Imamura
**TAT:** 5 Days
**Report No:** 87
**Date Printed** 1/15/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 010802-358-JMV-B161 | 011102-68 | 1/14/2002 | 1/14/2002 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg 358, Quad C, Room 162 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Calcareous Matrix, Mica

Globeteck

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name:*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** Wm Bradley
***TAT:*** Rush
***Report No:*** 223
***Date Printed:*** 3/8/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 5 ***Total # of Layer(s):*** 5

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B149 | 030702-06 | 3/7/2002 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg. 356, Quad C, 3rd Floor, Rm 370 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B150 | 030702-07 | 3/7/2002 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schorield Barracks **Location:** Bldg. 356, Quad C, 3rd Floor, Rm 370, **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B151 | 030702-08 | 3/072002 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg. 356, Quad C, 3rd floor, Rm 368 **Materials:** Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Calcareous Matrix, Mica

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B152 | 030702-09 | 3/7/2002 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Schofield Barrcks **Location:** Bldg. 356, Quad C, 3rd floor, Rm 368 **Materials:** Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%

**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B153 | 030702-10 | 3/7/2002 | 1 of 1 | Chrysotile | Tan | 1-3% |

**Project Name:** Schofield Barrcks **Location:** Bldg. 356, Quad C, 2nd floor, Rm 247 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B154 | 030702-11 | 3/7/2002 | Not Analyzed | N/A | N/A | N/A |

**Project Name:** Schofield Barrcks **Location:** Bldg. 356, Quad C, 2nd floor, Rm 247 **Materials:** N/A

**Other Fibrous Materials:** N/A

**Non-Fibrous Materials:** N/A

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hrs
**Report No:** 110
**Date Printed:** 1/23/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 5 **Total # of Layer(s):** 7

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B39 | 120601-05 | 12/6/01 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 226 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B44 | 120601-06 | 12/6/01 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 384 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B49 | 120601-07 | 12/6/01 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 140 **Materials:** Tan Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B54 | 120601-08 | 12/6/01 | 1 of 2 | None Detected | Blue | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 122 **Materials:** Blue Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B54 | 120601-08 | 12/6/01 | 2 of 2 | None Detected | Brown | N/A |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 122 **Materials:** Brown Glue

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Glue/Binder, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B59 | 120601-09 | 12/6/01 | 1 of 2 | Chrysotile | Beige | 1-3% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 122 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix, Vinyl, Binder, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B59 | 120601-09 | 12/6/01 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad C, Schofield Barracks **Location:** Bldg #358, Room 122 **Materials:** Black Mastic

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Asphalt/Binder, Calcite

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**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SALUT
**Client Address:** 3375 Koapaka St.
Hon, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 259-40
**Date Printed:** 12/14/2001
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 2

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120701-358-JMV-B97 | 121001-26 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Blue | N/A |

**Project Name:** Bldg # 358, Schofield Barracks **Location:** Bldg. 358, Room 148 **Materials:** Blue Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcareous Matrix
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120701-358-JMV-B11 | 121001-27 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Brown | N/A |

**Project Name:** Bldg # 358, Schofield Barracks **Location:** Bldg. 358, Room 354 **Materials:** Brown Compressed Fibrous Material
**Other Fiberious Materials:** Cellulose 20-30%, Mineral Wool 10-20%
**Non Fiberous Materials:** Perlite, Paint, Glue/Binder
**Sample Comments:**

**Analyst:** _____

Mohammad Rouf, MPH, CNMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SALUT
**Client Address:** 3375 Koapaka St.
Hon, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 259-43
**Date Printed:** 12/14/2001
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 2

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120601-358-JMV-B88 | 121001-21 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Black | N/A |

**Project Name:** Bldg. 358, Schofield Barracks **Location:** Bldg. 358, Room 218, Under Sink **Materials:** Black Mastic
**Other Fiberious Materials:**
**Non Fiberous Materials:** Asphalt/Binder, Calcite
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 120601-358-JMV-B72 | 121001-22 | 12/7/2001 | 12/10/2001 | 1 of 1 | Non-Detected | Light Gray | N/A |

**Project Name:** Bldg. 358, Schofield Barracks **Location:** Bldg. 358, Room 105 **Materials:** Compressed Fibrous Material
**Other Fiberious Materials:** Cellulose 30-40%
**Non Fiberous Materials:** Perlite, Paper, Glue Binder
**Sample Comments:**

Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT

**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 48
**Date Printed:** 1/3/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 3

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B89 | 010202-03 | 12/19/2001 | 1/2/2002 | 1 of 2 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 1st Floor, Room 106 **Materials:** Plaster

**Other Fiberious Materials:**

**Non Fiberous Materials:** Gypsum, Binder, Calcite, Mica

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B89 | 010202-03 | 12/19/2001 | 1/2/2002 | 2 of 2 | Non-Detected | Yellow | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 1st Floor, Room 106 **Materials:** Paint

**Other Fiberious Materials:** Cellulose 1%

**Non Fiberous Materials:** Gypsum, Binder, Calcite

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121301-357-JMV-B | 010202-04 | 12/19/2001 | 1/2/2002 | 1 of 1 | Non-Detected | Black | N/A |

**Project Name:** Schofield Barracks Bldg. 357 **Location:** Bldg. 357, 3rd Floor, Room 380 **Materials:** Black Cloth

**Other Fiberious Materials:** Fibrous Glass 10-20%

**Non Fiberous Materials:** Rubber, Binder, Mica

**Sample Comments:**

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Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hrs
**Report No:** 107
**Date Printed:** 1/23/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 6 **Total # of Layer(s):** 8

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B5 | 120401-08 | 12/4/1 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 1st Floor, Rm 166 **Materials:** Compressed Fibrous Material

**Other Fibrous Materials:** Cellulose 20-30% Mineral Wool 5-10%
**Non-Fibrous Materials:** Perlite, Paint, Glassbeads, Glue/Binder

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B10 | 120401-09 | 12/4/1 | 1 of 2 | Chrysotile | Green | 1-3% |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 1st Floor, Rm 162 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B10 | 120401-09 | 12/4/1 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 1st Floor, Rm 162 **Materials:** Mastic

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Asphalt/Binder, Calcite

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B15 | 120401-10 | 12/4/1 | 1 of 1 | None Detected | Yellow | N/A |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 2nd Floor, Rm 277 **Materials:** Fibrous Backing

**Other Fibrous Materials:** Cellulose 3-5% Fibrous Glass 50-60%

**Non-Fibrous Materials:** Glue, Metal Fril, Binder Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B20 | 120401-11 | 12/4/1 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 2nd Floor, Rm 275 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B25 | 120401-12 | 12/4/1 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 3rd Floor, Rm 372 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B30 | 120401-13 | 12/4/1 | 1 of 2 | Chrysotile | Green | 1-3% |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 3rd Floor, Rm 365 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Calcareous Matrix

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B30 | 120401-13 | 12/4/1 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad c, Schofield Barracks **Location:** Bldg #358, 3rd Floor, Rm 365 **Materials:** Mastic

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Asphalt/Binder, Calcite

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Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

Globeteck

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## CERTIFICATE OF ANALYSIS

Client: SaLUT, Inc.

Address: 11609 Edmonston Road
Beltsville, Maryland 20705

Attention: Tina Perry-Finau

Job Name: Schofield Barracks

Job Location: Building 358 - Quad C

Job Number: 01-290

P.O. Number: Not Provided

Chain Of Custody: 92217

Date Analyzed: 04/30/2002

Person Submitting: Ken Reynolds



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0244071 | 120301-358-JMV-B39 | NAD | – | – | – | – | – | – | TR | – | – | 100 | Beige | JC | |
| 0244072 | 120301-358-JMV-B44 | NAD | – | – | – | – | – | – | – | – | – | 100 | Beige | JC | |
| 0244073 | 120301-358-JMV-B49 | NAD | – | – | – | – | – | – | TR | – | – | 100 | Blue | JC | |
| 0244074 | 120301-358-JMV-B54 | NAD | – | – | – | – | – | – | – | – | – | 100 | Blue | JC | |
| 0244075 | 120301-358-JMV-B59 | NAD | – | – | – | – | – | – | – | – | – | 100 | Beige | JC | |
| 0244076 | 120601-358-JMV-B88 | NAD | – | – | – | – | – | – | – | – | – | 100 | Black | JC | |
| 0244077 | 120701-358-JMV-B97 | NAD | – | – | – | – | – | – | – | – | – | 100 | Blue | JC | |
| 0244078 | 121301-358-JMV-B152 | NAD | – | – | – | – | – | – | – | – | – | 100 | Beige | JC | |

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the acc[illegible]y and completeness of this information. Residual sample material will be discarded in ac[illegible]dance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to pol[illegible] light microscopy of bulk samples and transmission electron microscopy of AHERA air s[illegible]s. All rights reserved. AM[illegible]ytical Services, Inc.

An AIHA (#8863), NVLAP (# 101143), & New York ELAP (#10920) Accredited Laboratory
4475 Forbes Blvd • Lanham, MD 20706 • (301) 459-2640 • Toll Free (800) 346-0961 • Fax (301) 459-2643

**AMA Analytical Services, Inc.**

**Electron & Optical Microscopy Services**

# CERTIFICATE OF ANALYSIS

NVLAP
NY ELAP
AIHA

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | SaLUT, Inc. | **Job Name:** | Schofield Barracks | **Chain Of Custody:** | 92217 |
| **Address:** | 11609 Edmonston Road | **Job Location:** | Building 358 - Quad C | **Date Analyzed:** | 04/30/2002 |
| | Beltsville, Maryland 20705 | **Job Number:** | 01-290 | **Person Submitting:** | Ken Reynolds |
| | | **P.O. Number:** | Not Provided | | |
| **Attention:** | Tina Perry-Finau | | | | |



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

John Contreras

John Contreras

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples.

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# AMA Analytical Services, Inc.

Electron & Optical Microscopy Services

NVLAP
NY ELAP
AIHA

## CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| Client: | SaLUT, Inc. | Job Name: | Schofield Barracks | Chain Of Custody: | 92206 |
| Address: | 11609 Edmonston Road | Job Location: | Building 358 - Quad C | Date Analyzed: | 03/06/2002 |
| | Beltsville, Maryland 20705 | Job Number: | 01-290 | Person Submitting: | Tina Perry-Finau |
| | | P.O. Number: | Not Provided | | |



Attention: Tina Perry-Finau

## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0233241 | 021902-358-JSW-B181 | NAD | – | – | – | – | – | TR | 3 | – | – | 97 | Gray | RRW | |

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Robert Workman

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12/2/01

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Bldg #358 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-07-01
Turn Around Time: 72 hours

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 120701-358-JMV - B97 | Rm 148 | | | | | | | | |
| 120701-358-JMV - B117 | Rm 354 | | | | | | | | |

| Relinquished by: John Willard | Received by: Mohammad Rauf | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 1430 12-7-01 | Time/Date: 12-7-01 | Time/Date: |

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: 01-290 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: John Veitch
Sample Date: 12-6-01
Turn Around Time: 72 hr

ANALYSIS REQUESTED

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|---|
| 21001-21 | 120601-358-JMV B68 | Under sink, RM 218, Bldg 358 | X | | | | | | | |
| 22 | " " B72 " | RM 105, Bldg 358 | X | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Schofield Barracks, BLDG 356-Quad C
Client: SAIC
Project # 01-290
Sampled by: JSW
Sample Date: 03/07/02
Turn Around Time: 030702 Rush

ANALYSIS REQUESTED: Asbestos (PLM/PCM), Lead Air/Wipe, Lead Paint/Soil, TCLP Pb, TCLP 8 Metals, Arsenic Samples, Total RCRA 8 Metals

| SAMPLE ID | LOCATION | Asbestos (PLM/PCM) | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 030702 356-JW-B149 | 3rd FLR, Rm 370 *Test Tile only* | ✓ | | | | | | | |
| 7 B150 | | ↓ | | | | | | | |
| 8 B151 | Rm 368 | ↓ | | | | | | | |
| 9 B152 | | ↓ | | | | | | | |
| 10 B153 | 2nd FLR, Rm 247 | ↓ | | | | | | | (7) |
| 11 B154 | | ↓ | | | | | | | Sample not Analyze |

| Relinquished by: John Willard | Received by: W. Bradley | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 03-07-02 | Time/Date: 3/7/02 | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Schofield Barracks Bldg 357
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-13-01
Turn Around Time:

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 010202-03 12301-357-JMV-B 89 | 1st Floor, Rm 106 | ✓ | | | | | | | |
| 04 12301-357-JMV-B | 3rd Floor, RM 380 | ✓ | | | | | | | |
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| Relinquished by: John Veitch | Received by: | Relinquished by: |
| Signature: | Signature: | Signature: |
| Time/Date: 12/19/01 | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-13-01
Turn Around Time: 72 hours

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 23101-05 12-13-01-368-JMV-B152 | 3rd Floor, RM 368 | ✓ | | | | | | | |
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|---|---|---|
| Relinquished by: John Veitch | Received by: | Relinquished by: |
| Signature: [signature] | Signature: | Signature: |
| Time/Date: 12/19/01 | Time/Date: | Time/Date: |

Globeteck Group, Inc
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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Schofield Barracks, Quad C, Bldg 358
Client: SaLUT
Project # 01-290 Schofield Barracks
Sampled by: JMV
Sample Date: ~~01-08-02~~ 1/11/02
Turn Around Time: 5 day

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 111102-68 010802-358-JMV-B161 | RM162 | X | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: | Time/Date: | Time/Date: |

**AMA Analytical Services, Inc.**

AIHA (#8863) NVLAP (#1143) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 92206

**MAILING ADDRESS:**

1. Submittal Date: _____ Job Name/location: Schofield Barracks, Bldg 358 - Area C
2. Client Name: SOLUT, Inc. (Honolulu) Job #: 01-290 P.O. #: _____
3. Street/RFD/P.O. Box: 875 Keeaumoku St. #1286 Bill To: SOLUT, Inc.
4. City, State, Zip: Honolulu HI 96814 Phone #: 808 833 6455 Fax: 808 833 6456
5. Contact Person: Tuo Pang-Finau Submitted By: T. Pang-Finau (Print) (Signature)
6. DATE & TIME RESULTS REQUIRED: 3/6/02 Time: 12:00 PM ☐ IMMED. ☐ 24HR ☐ 48HR ☐ 72HR ☐ 5 DAY OTHER (Specify)

**SAMPLE DATA:**

1. Analysis Type: ☑ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☑ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify): _____
2. Total Number Of Samples: TEM _____ PCM _____ PLM _____ LEAD _____ OTHER (Specify) _____
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: PC ☐ MCE ☐ B. Porosity: _____ Micron C. Diameter: ☐ 47mm ☐ 25mm
4. LEAD SAMPLES Wipe Type: ☐ Face ☐ Palmtest ☐ Ghost ☐ Hydrite Products ☐ Tilfone (Specify)
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☐ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS: TEM | PCM | PLM | LEAD | OTHER | MATRIX: AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01906 (358 Roof Sample) | | 1st floor Lanai | 3/6/02 | | | | ✓ | | | | | | | | |
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**REPORTING DATA:**

1. Verbal Results To Whom? Name: _____ Phone: _____ Beeper: _____
2. Date Written Results Required ____ / ____ / ____

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 3 / 6 / 02 @ Via: By (Print): Sign:
2. Date/Time Analyzed: 3 / 6 / 02 @ 1155 By (Print): Sign:
3. Results Reported To: Via: Date: Time:
4. Comments:

**AMA Analytical Services, Inc.**

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 9__17

**MAILING ADDRESS:**

1. Submittal Date: 29 MAR 02 — Job Name/location: Schofield Barracks, BLDG 358 - Quad C
2. Client Name: SALUT — Job #: 01-290 — P.O. #:
3. Street/RFD/P.O. Box: 3375 Koapaka St. STE B286 — Bill To: SALUT
4. City, State, Zip: Hon. Hi. 96819 — Phone #: 808-833-6155 — Fax: 808-833-6156
5. Contact Person: Tina Perry - Finan — Submitted By: Ken Reynolds (Print) Ken Reynolds (Signature)
6. DATE & TIME RESULTS REQUIRED: 4/30/02 Time: 1200 AM PM ☐ IMMED. ☐ 24HR ☐ 48HR ☐ 72HR ☒ 5-DAY OTHER (Specify):

**SAMPLE DATA:**

1. Analysis Type: ☒ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☒ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify):
2. Total Number Of Samples: TEM ____ PCM ____ PLM 8 LEAD ____ OTHER (Specify) ____
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: PC ☐ MCE ☐ B. Porosity: ____ Micron C. Diameter ☐ 37mm ☐ 25mm
4. LEAD SAMPLES: Wipe Type: ☐ Pace ☐ Palmiest ☐ Ghost ☐ Lynx Products ☐ Other (specify)
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☒ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION** / **ANALYSIS** / **MATRIX**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | TEM | PCM | PLM | LEAD | OTHER | AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120301-358-JMV-B39 | | 2nd FLR, Rm 226 | 12/03/01 | | | | | ↓ | | | | | | | |
| 120301-358-JMV-B44 | | 3rd FLR, Rm 384 | 12/03/01 | | | | | | | | | | | | |
| 120301-358-JMV-B49 | | 1st FLR, Rm 143 | 12/03/01 | | | | | | | | | | | | |
| 120301-358-JMV-B54 | | 1st FLR, Rm 122 | 12/03/01 | | | | | | | | | | | | |
| 120301-358-JMV-B59 | | 1st FLR, Rm 122 | 12/03/01 | | | | | | | | | | | | |
| 120601-358-JMV-B88 | | 2nd FLR, Rm 218 | 12/06/01 | | | | | | | | | | | | |
| 120701-358-JMV-B97 | | 1st FLR, Rm 148 | 12/07/01 | | | | | | | | | | | | |
| 121301-358-JMV-B152 | | 3rd FLR, Rm 368 | 12/13/01 | | | | | | | | | | | | |

**REPORTING DATA:**

1. Verbal Results To Whom? Name: ____ Phone: ____ Beeper: ____
2. Date Written Results Required ____/____/____

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 4/30/02 @ 1200 Via: [illegible] By: [illegible] Sign: [illegible]
2. Date/Time Analyzed: 4/30/02 @ 1100 By: John Contreras Sign: [illegible]
3. Results Reported To: Tina Perry Finan Via: Fax Date: 4/30/02 Time: 1152 Initials: JC
4. Comments:

ATTACHMENT 21

# ASBESTOS INSPECTION REPORTS, QUAD C - BLDGS 355 AND 356

# ASBESTOS INSPECTION REPORTS

## Schofield Barracks
## Quad C - Buildings 355 and 356

Submitted to

U.S. Army Corps of Engineers
Honolulu Engineer District
Attn: CEPOH-EC-E, Building 230 (Miriam Koyanagi)
Fort Shafter, Hawaii 96858-5440

Submitted by

Soil and Land Use Technology, Inc.
3375 Koapaka Street, Suite B286
Honolulu, Hawai'i 96819

Contract DACA83-01-D-0017
Task Order #0001

March 2003

# PREFACE

These two volumes contain the asbestos reinspection reports for Quad C at Schofield Barracks. Quad C consists of Buildings 355, 356, 357, and 358. The asbestos reinspections were performed by Soil and Land Use Technology, Inc. under Task 0001 of Contract #DACA83-01-D-0017. The reinspections were performed between November 30, 2001 and March 12, 2002.

The following information is provided in each report:

- ❑ Name and location of the building inspected
- ❑ Date the inspection was performed
- ❑ Names of the certified inspectors who conducted the inspection
- ❑ Summary tables describing the type, location, condition, and quantity of identified asbestos containing materials
- ❑ Discussion of findings and recommendations
- ❑ Photographs of all identified asbestos containing materials
- ❑ Building drawings in Microstation® format, with sample numbers and locations of asbestos-containing materials indicated
- ❑ Laboratory sample analysis results and chain of custody documents for each sample collected from the building

Following the building inspection reports are the Sampling and Analysis Plan (SAP) for Task 0001 and certifications of the inspectors and analytical laboratories that participated in the surveys. The SAP details the methodology used in performing the inspections, including discussion of applicable regulations and sampling protocols. The certifications include the following:

- ❑ Asbestos Hazard Emergency Response Act (AHERA) Inspector certificates
- ❑ State of Hawai'i Inspector cards
- ❑ National Voluntary Laboratory Accreditation Program (NVLAP) certificates and State of Hawai'i certification letters for analytical laboratories

# Schofield Barracks

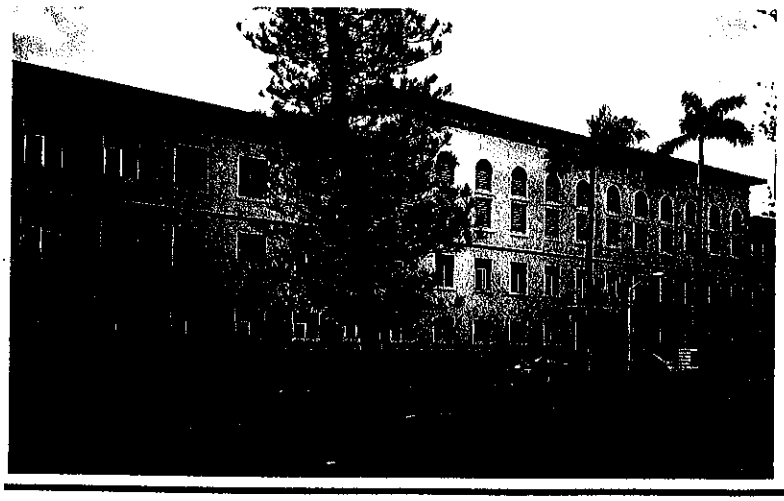
# Building 355

# Executive Summary

Soil and Land Use Technology, Inc. (SaLUT) performed an asbestos identification and assessment reinspection of Building 355 located at Schofield Barracks, Hawaii. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 355 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included to the extent that the suspect materials found in those surveys could be identified. The survey was conducted by SaLUT in accordance with the U.S. Army Corps of Engineers Honolulu Engineer District Scope of Work dated September 18, 2001. The survey was conducted December 13, 2001, through February 20, 2002.

All accessible areas of the building were inspected for suspect asbestos-containing building materials (ACBMs). One hundred and forty-seven samples of suspect asbestos containing material were collected. Analytical results confirmed that asbestos is present as floor tile, floor tile mastic, and ceiling plaster. A summary of the ACBMs encountered is provided on the next page. This report provides a detailed description of the ACBM locations, quantities, and hazard assessments based on conditions existing at the time of the inspection. No areas were found to contain ACBM causing high or imminent exposure potential.

*Photograph 1. Front of Building 355.*



*Photograph 2. Rear of Building 355.*

## BUILDING SUMMARY

| | |
|---|---|
| **Facility** | Schofield Barracks |
| **Building** | 355 |
| **Inspector(s)** | John Willard, Kenneth Reynolds, JohnVeitch |
| **Inspection Date(s)** | December 13, 2001 through February 20, 2002 |
| **Building Area** | 69,000 s.f. |

**Inaccessible areas (overview)**

None

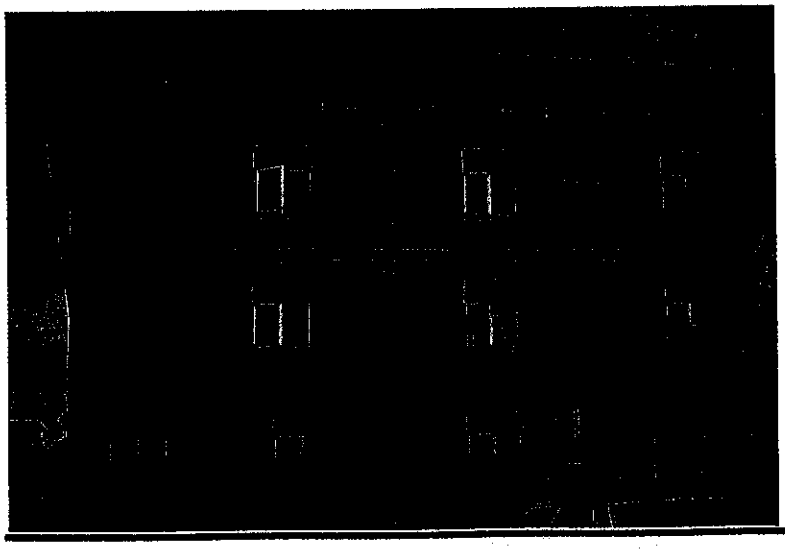
**Areas with limited access (overview)**

Beneath wall-to-wall carpeting (indicated as "LCA" on building drawings)

**Areas with no access (overview)**

Above ceilings with no access (indicated as "NAC" on building drawings)
Rooms that were sealed (indicated as "NA" on building drawings)

| Types of ACBMs Encountered | | Approximate Quantity |
|---|---|---|
| **Thermal System Insulation** | None | |
| **Surfacing** | Ceiling plaster | 840 sf |
| **Miscellaneous** | Floor tile<br>Floor tile mastic | 10,870 sf<br>33,325 sf |
| **Functional Areas with High to Imminent Exposure Potential** | None | |



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# 1 Introduction

SaLUT performed an inspection of Building 355 to identify and assess all accessible ACBMs. This was a reinspection conducted on December 13, 2001, through February 20, 2002, in accordance with the requirements outlined in the Scope of Work dated September 18, 2001. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 355 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included.

The following is a description of the building:

| | |
|---|---|
| **Function** | Barracks |
| **Size** | 69,000 square feet; three floors |
| **Foundation** | Concrete |
| **Exterior walls** | Concrete masonry units with plaster coating |
| **Roof** | Asphalt roofing paper over foam |
| **Mechanical systems** | Main mechanical room containing furnace and boiler on First Floor; secondary mechanical rooms on Second and Third Floors; pipes are uninsulated |
| **Climate control** | Central heating and cooling system; ducts are bare or insulated with fiberglass |
| **Interior walls** | Concrete masonry units, drywall |
| **Floors** | Floor tile, concrete, carpet, ceramic tile |
| **Ceilings** | Ceiling tiles; fixed ceilings with ceiling plaster in some spaces |

Survey and assessment protocols were based on those adopted by the U.S. Environmental Protection Agency (EPA) as detailed in the Asbestos Hazard Emergency Response Act (AHERA; 40 CFR 763, Subpart E), and those of the Hawaii Department of Health in Hawaii Administrative Rule (HAR) 11-502 *Asbestos-Containing Materials in Schools.* In addition to identifying materials considered suspect by AHERA survey protocols, accessible roofing and other exterior materials were also addressed. SaLUT's inspectors identified and sampled all materials considered to be suspect under the regulations and other documents listed in Section 2 *Applicable Documents,* as well as those materials that have been found through other available literature and inspectors' experience (e.g., leveling paper and silver exterior paint) to potentially contain asbestos. This report does not address those suspect materials that would be expected in the building (e.g., sink undercoating in bathrooms of a residence)but were not encountered; the reader should assume that, if a suspect material is not mentioned in Section 3 *Findings,* the material was not found in the building.

For the following reasons, SaLUT's survey differed from a normal reinspection, wherein the locations and conditions of previously identified ACBMs are verified, and the impacts of building renovations are determined:

- **Inability to identify the Baker survey's homogeneous materials with certainty.** Photographs of the positive materials were not included in the Baker inspection report available at the Directorate of Public Works (DPW). Many of the types of floor tile in the original survey were described by their predominant color only. Other types of floor tile appear to have received more than one description (possibly due to having been described by different inspectors).

- **Multiple layers of floor tile.** Many rooms had multiple layers of floor tile. Numerous instances were identified where floor tile located in the 1993 survey had been covered by other types of tile. This made it impractical to carry out the following tasks with completed accuracy:
  - Verify all locations of floor tiles identified in the original survey
  - Quantify types of floor tile
  - Identify all types of floor tile in the building (it was assumed that all types of floor tile were visible in at least one location)

To deal with these issues, under the direction of SaLUT's Project Manager and Principal Investigator, the inspectors modified the survey protocol as follows:

- **Floor tile.** Where a floor tile type could be sampled by SaLUT's inspectors without causing unacceptable damage, the original inspection was ignored, the floor tile was given a SaLUT homogeneous material identification, and the floor tile was sampled in accordance with the SAP. If the material could be equated to a type of Baker floor tile, this was noted. Where older types of floor tile were noted below SaLUT's samples, but the older materials could not be sampled, the floor tile and associated mastic were identified from the material locations in Baker's report. Quantities of asbestos-containing floor tile and associated floor tile mastic below the top layer of floor tile were assumed to extend throughout the entire room.

- **Other materials identified in previous inspections.** For all other materials (including those that were determined to not contain asbestos) that had been identified in the previous inspections, SaLUT's inspectors attempted to locate the materials. In a number of cases, the materials had been abated during various renovation projects.

  The DPW survey identified one positive material (white/cream sealant above the ceiling of Rooms 144 and 333) not identified in the Baker survey. No photograph of this positive material was included in the inspection report. SaLUT's inspectors were unable to locate this material. It is possible that the material was abated.

- **Other materials not identified in previous inspection.** SaLUT's inspectors identified and sampled a number of suspect materials (e.g., types of caulking) that were not identified previously.

- ❑ Ceiling Tile. A number of samples were taken by SaLUT to confirm Baker's results that all no ceiling tiles contained asbestos. At that point, SaLUT stopped sampling ceiling tile and Baker's inspection results were accepted.

All samples were collected in accordance with the Sampling and Analysis Plan (SAP) for the task except as noted above. Where applicable, corners of wall-to-wall carpeting were lifted to examine flooring materials under the carpet. Metal roofs that would not support the inspector's weight were examined visually; if suspect materials were identified they were presumed to contain asbestos unless they could be sampled from an accessible edge of the roof. These situations, as well as other special situations, are discussed in the SAP located in Appendix A of this volume.

On-site inspection and assessments were conducted by John Willard, Kenneth Reynolds, and John Veitch, EPA and State of Hawai'i accredited Asbestos Inspectors. Quality control review was conducted by Dr. David M. Heisler (Principal Investigator).

# 2 Applicable Documents

The following are the regulations, standards, and other documents applicable to the survey:

### U.S. Army Publications

| | |
|---|---|
| AR 200-1 | Environmental Protection and Enhancement |
| AR 385-40 | Accident Reporting and Records |
| EM 385-1-1 | USACE, Safety and Health Requirements Manual, 3 Sep 96 |
| AR-420-70 | Building and Structures |
| TB 420-70-8 | Asbestos Survey and Abatement |

### Title 29 Code of Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration Standards

| | |
|---|---|
| Part 1910.20 | Access to Employee Exposure and Medical Records |
| Part 1910.95 | Occupational Noise Exposure |
| Part 1910.134 | Respiratory Protection |
| Part 1910.1000 | Air Contaminants – Permissible Exposure Limits |
| Part 1910.1001 | Asbestos |
| Part 1910.1200 | Hazard Communication |
| Part 1926.59 | Hazard Communication Construction |
| Part 1926.1101 | Asbestos in Construction |

### Title 40 Code of Federal Regulations, Environmental Protection Agency Standards

| | |
|---|---|
| Part 61 Subpart A | National Emission Standards for Hazardous Air Pollutants |
| Part 763 | Asbestos Hazard Emergency Response Act |

### American National Standards Institute Standards

| | |
|---|---|
| Z9.2-1979 | Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| Z88.20-1988 | Practices for Respiratory Protection |

### U.S. Environmental Protection Agency Guidelines

| | |
|---|---|
| EPA/600/R-93/116 | Method of the Determination of Asbestos in Bulk Building Materials |
| EPA/5605-85-024 | Guidance for Controlling Asbestos Containing Building Materials |

**Underwriters Laboratories, Inc. Publications**

| | |
|---|---|
| 586-77 (R-1982) | Test Performance of High Efficiency Particulate Air Filter Units |

**State of Hawai'i Occupational Safety and Health Standards**

| | |
|---|---|
| HIOSH 12-145 | Asbestos in Construction |

**Hawai'i Administrative Rules**

| | |
|---|---|
| Chapter 11-501 | Asbestos Requirements |
| Chapter 11-502 | Asbestos Containing Materials in Schools |
| Chapter 11-503 | Fees for Asbestos Removal and Certification |
| Chapter 11-504 | Asbestos Abatement Certification Program |

**USAED, Honolulu Contractual Documents**

| | |
|---|---|
| Contract DACA83-01-D-0017 | Indefinite-Delivery Indefinite-Quantity (IDIQ) Services Contract for Asbestos/Lead Survey and Abatement Services for Honolulu Engineer District (HED) Area of Responsibility, 14 September 2001 |
| Contract DACA83-01-D-0017<br>Task Order 0001<br>Scope of Work | Asbestos Survey for Various Buildings at Pohakuloa Training Area, Wheeler Army Airfield, Fort Shafter, Tripler Army Medical Center, Waianae Recreational Center, Pohakuloa Training Area and Kiluea Military Reservation, Hawaii |

**Previous Asbestos Surveys**

*Asbestos Survey and Management Plan Report for Building 355 of Quad C at the Schofield Barracks Military Reservation, Hawaii*, Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter

*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii*, Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii

# 3 Findings

Sixty-four homogeneous materials suspected of potentially containing asbestos were identified and sampled by SaLUT. SaLUT also identified, but did not sample, an additional 12 types of floor tile and mastic that were found to be ACBM by Baker. SaLUT collected 147 bulk asbestos samples that were analyzed by White Environmental Consultants, Inc. and Globeteck at their National Voluntary Laboratory Accreditation Program (NVLAP) - accredited laboratories in Honolulu using polarized light microscopy/dispersion staining (PLM/DS) techniques. For some homogeneous materials, the laboratories used a *stop on positive* procedures whereby if one sample was confirmed as ACBM, the remaining samples were not analyzed. Composite samples of floor tile and floor tile mastic were split and the two components were analyzed individually as required by AHERA regulations. Therefore, the number of samples collected differs from the number of analyses. SaLUT submitted duplicates of six of the samples analyzed by White to Globeteck for quality control analysis. Both layers (floor tile and mastic) of one sample (B58) were found by Globeteck to be ACBM. Laboratory analysis sheets for all samples collected by SaLUT, including the quality control analyses, are located at the end of this report. Laboratory analysis sheets for samples collected during the previous surveys are found in those reports.

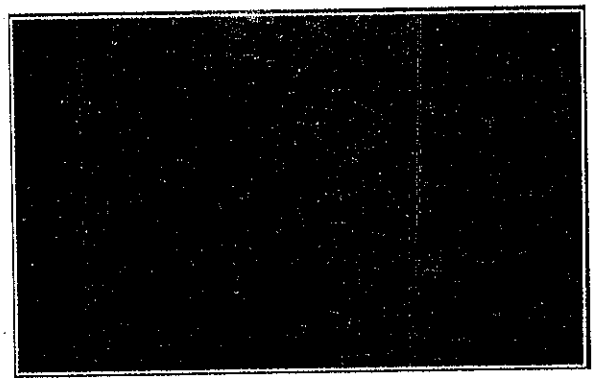
As a result of these laboratory analyses, 12 homogeneous materials (two types of floor tile, nine types of floor tile mastic, and ceiling plaster) were confirmed as ACBM by sample analysis, in addition to the 12 types of asbestos-containing floor tile and mastic identified by Baker and remaining in the building. The condition of the encountered positive materials was good, although some floor tiles are broken. Photographs 4 through 13 illustrate the ACBMs sampled by SaLUT. SaLUT was unable to photograph the ACBMs identified by Baker because they located below underneath floor tile sampled by SaLUT and were only revealed in the small areas where SaLUT's samples were taken.

Baker indicated that plaster on the Second Floor exterior was ACBM. Anecdotal evidence from various sources mentions occasional plaster samples from the exteriors of Quad buildings that were ACBM. However, as was the case for SaLUT's plaster samples, all of Baker's plaster samples (including interior plaster) from Quad C contained either no asbestos or less than 1 percent asbestos. Therefore, under AHERA and SaLUT's SAP, none of the plaster is ACBM.

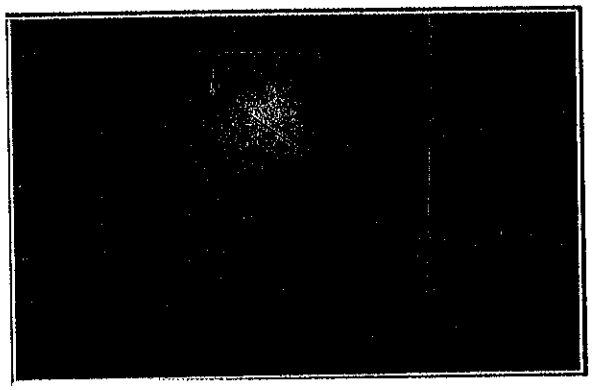
All identified homogeneous materials considered to be potentially asbestos containing ("suspect") are listed on the *Homogeneous Materials Listing* (Table 1). These materials are grouped according to class (i.e., miscellaneous, surfacing, and thermal system insulation) and floor of the building. For each suspect material, the friability, general locations in the building, and sample numbers are indicated, as well as whether the material was determined to be ACBM or not. Red sample numbers indicate those samples that contained asbestos. Gray sample numbers indicate samples that were not analyzed because another sample of the same material contained asbestos. Suspect materials identified as ACBM by quality control analysis are identified by an asterisk (*) following the appropriate sample number. The ACBMs identified by Baker and not sampled by SaLUT are listed following SaLUT's homogeneous materials.

Sample collection sites for identified suspect ACBMs, as well as locations of identified ACBMs, are indicated on the building drawings (Figure 1).

Table 2, *Summary of Asbestos-Containing Materials*, provides a summary of the encountered ACBMs in the building. Each material is listed with information regarding the type, location, and condition of the ACBM, along with the recommended response action for the material.

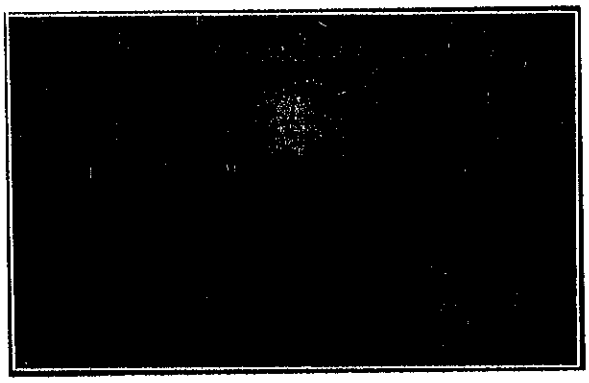


*Photograph 4. FT2 and FM2. This floor tile (FT2) and mastic (FM2) both contain asbestos.*

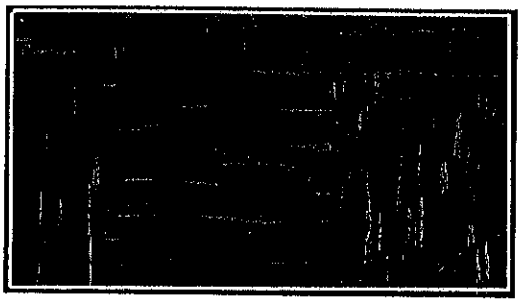


*Photograph 5. FM4. This mastic (FM4) below this floor tile (FT4) contains asbestos. The floor tile does not contain asbestos.*

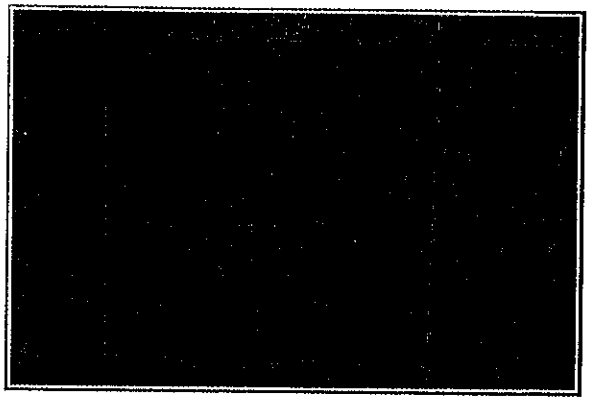
*Photograph 6. FM5. This mastic (FM5) below this floor tile (FT5) contains asbestos. The floor tile does not contain asbestos.*



*Photograph 7. FM6. This mastic (FM6) below this floor tile (FT6) contains asbestos. The floor tile does not contain asbestos.*

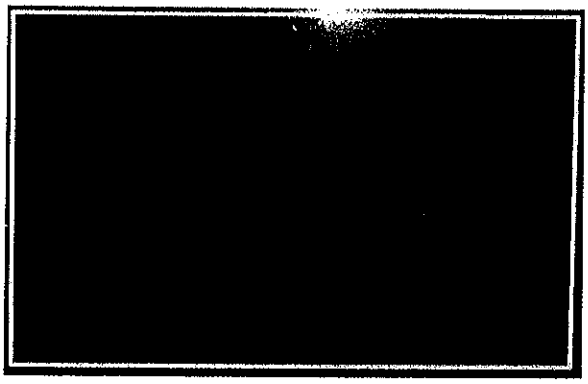


*Photograph 8. FM7. This mastic (FM7) below this floor tile (FT7) contains asbestos. The floor tile does not contain asbestos.*



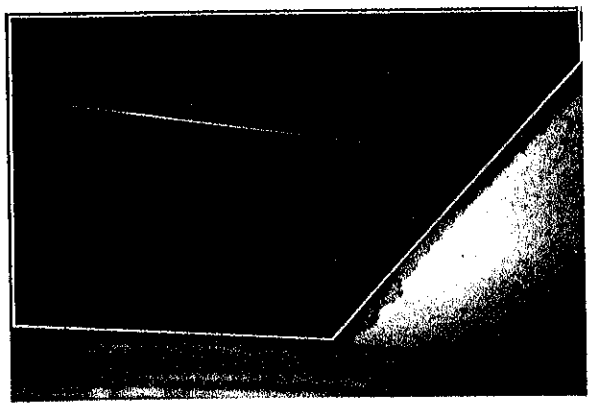
*Photograph 9. FM12. This mastic (FM12) below this floor tile (FT12) contains asbestos. The floor tile does not contain asbestos.*

*Photograph 10. FM14. This mastic (FM14) below this floor tile (FT14) contains asbestos. The floor tile does not contain asbestos.*



*Photograph 11. FM15. This mastic (FM15) below this floor tile (FT15) contains asbestos. The floor tile does not contain asbestos.*

*Photograph 12.FT16 and FM16. This floor tile (FT16) and mastic (FM16) both contain asbestos.*



*Photograph 13.PL1. This asbestos containing ceiling plaster is found in Rooms 103 and 112.*

**Table 1. Homogeneous Materials Listing. Descriptions of asbestos-containing materials from Baker's survey are taken from Baker's report.**

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| Material Description | | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| CT1 | 2'x4' white ceiling tile | Yes | Most First Floor rooms | B3, B4, B9, B20, B21, B22, B23, B63, B68, B69, B102, B103 | No | |
| DW1 | Sheetrock | Yes | Many First Floor walls | B131, B132, B133 | No | |
| FM1 | Yellow mastic | No | Below FT1 | B1, B100, B101 | No | |
| FM2 | Black mastic | No | Below FT2 | B2, B70, B71 | Yes | 1,363 sf |
| FM3 | Yellow mastic | No | Below FT3 | B6, B104, B105 | No | |
| FM4 | Black mastic | No | Below FT4 | B7, B110, B111 | Yes | 566 sf |
| FM5 | Black mastic; same as Baker's M023 | No | Below FT5 | B8, B62, B67 | Yes | 8,670 sf |
| FM6 | Black mastic; same as Baker's M026 | No | Below FT6 | B10, B17, B18 | Yes | 3,490 sf |
| FM7 | Black mastic | No | Below FT7 | B11, B12, B13 | Yes | 69 sf |
| FM8 | Yellow mastic | No | Below FT8 | B14, B15, B16 | No | |
| FM9 | Black mastic | No | Below FT9 | B19, B108, B109 | No | |
| FM17 | Yellow mastic | No | Below FT17 | B61, B112, B113 | No | |
| FT1 | 12"x12" white floor tile with black streaks; same as Baker's M031 | No | Rooms 102, 103, 139 | B1, B100, B101 | No | |
| FT2 | 12"x12" brown floor tile with brown specks | No | Rooms 103, 112, 132, 133 | B2, B70, B71 | Yes | 1,363 sf |
| FT3 | 12"x12" white floor tile with brown streaks; same as Baker's M029 | No | Room 112 | B6, B104, B105 | No | |
| FT4 | 12"x12" white floor tile with gray specks | No | Room 118 | B7, B110, B111 | No | |
| FT5 | 12"x12" tan floor tile with brown and white mottles; same as Baker's M023 | No | Hallways 128, 141, 142, rooms 114, 118-126, 130, 131, 137, 144, 145, 147-152 | B8, B62, B67 | No | |
| FT6 | 12"x12" cream floor tile with brown and gray specks; same as Baker's M025 | No | Hallways 106-108, rooms 110, 114, 137, 151, 152 | B10, B17, B18 | No | |
| FT7 | 9"x9" brown floor tile with read and white streaks | No | Room 110 | B11, B12, B13 | No | |
| FT8 | 12"x12" blue floor tile with white and blue specks | No | Room 110 | B14, B15, B16 | No | |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| FT9 | 12"x12" light olive floor tile with brown and white specks; same as Baker's M032 | No | Room 152 | B19, B108, B109 | No | |
| FT17 | 12"x12" blue floor tile with white specks | No | Room 146 | B61, B112, B113 | No | |
| PA1 | Black coating on vertical pipe | No | Mechanical room (Room 139) | B117, B118, B119 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M026 | Flooring adhesive Black | No | Rooms 151, 152 | See Baker's report | Yes | 1,675 sf |
| M027 | 12 x 12 floor tile Beige | No | Room 137 | See Baker's report | Yes | 1,121 sf |
| M028 | Flooring adhesive Black | No | Below M027 | See Baker's report | Yes | 1,121 sf |
| Second Floor | | | | | | |
| CT2 | 2'x4' white ceiling tile | Yes | Most Second Floor Rooms | B24, B25, B26, B31, B32, B33, B56, B73, B77 | No | |
| DW2 | Sheetrock | Yes | Many Second Floor walls | B140, B141, B142 | No | |
| FM10 | Yellow mastic | No | Below FT10 | B27, B28, B72 | No | |
| FM11 | Yellow mastic | No | Below FT11 | B29, B30, B52 | No | |
| FM15 | Black mastic | No | Below FT15 | B57, B126, B127 | Yes | 232 sf |
| FM16 | Yellow/Black mastic | No | Below FT16 | B58*, B59, B60 | Yes | 377 sf |
| FM18 | Yellow mastic | No | Below FT18 | B74, B75, B76 | No | |
| FM20 | Yellow mastic | No | Below FT20 | B80, B81, B82 | No | |
| FT10 | 12"x12" blue floor tile with white specks (same as Baker's M018) | No | Rooms 224, 226-228, 233, 240, 244, 246, 250, 253, 257 | B27, B28, B72 | No | |
| FT11 | 12"x12" white floor tile with brown and gray specks | No | Rooms 201, 202, 205, 207, 209, 211, 212, 215, 217, 222, 230-232, 238, 239, 242, 243, 245, 250, 254, 256, 258, 260, 266, 268, 269, 274, 277 | B29, B30, B52 | No | |
| FT15 | 12"x12" white floor tile with brown streaks | No | Room 281 | B57, B126, B127 | No | |
| FT16 | 12"x12" gray floor tile with brown streaks | No | Room 278 | B58*, B59, B60 | Yes | 377 sf |
| FT18 | 12"x12" white floor tile with gray specks (same as Baker's M016) | No | Rooms 249, 252, 253, 255, 258, 260 | B74, B75, B76 | No | |
| FT20 | 12"x12" white floor tile with brown and black streaks | No | Room 208 | B80, B81, B82 | No | |
| SK1 | Gray sink undercoating | No | Rooms 219, 265 | B37, B78, B114 | No | |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M043 | Flooring adhesive Black | No | Rooms 336-339, 341-344 | See Baker's report | Yes | 1,740 sf |
| M045 | Flooring adhesive Black | No | Hallways 330, 333, 335, 359, 360 | See Baker's report | Yes | 874 sf |
| Roof | | | | | | |
| AR1 | Asphalt roofing paper over foam | No | Roof | B120, B121, B122 | No | |

| Surfacing Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor (including exterior) | | | | | | |
| PL1 | Ceiling plaster | No | Room 103, 112 | B5, B106, B107 | Yes | 840 sf |
| PL6 | Exterior wall plaster | No | Exterior | B128, B129, B130 | No | |
| Second Floor (including exterior) | | | | | | |
| PL2 | Wall plaster | Yes | Room 220 | B34, B35, B36 | No | |
| PL4 | Wall plaster | Yes | Room 269 | B53, B54, B55 | No | |
| PL7 | Exterior wall plaster over cement blocks | No | Exterior | B134, B135, B136 | No | |
| PL8 | Exterior wall plaster | No | Exterior | B137, B138, B139 | No | |
| Third Floor (including exterior) | | | | | | |
| PL9 | Exterior wall plaster | No | Exterior | B146, B147, B148 | No | |
| Roof | | | | | | |
| PL5 | Textured plaster | No | Chimneys | B123, B124, B125 | No | |

| Thermal System Insulation Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| MJ1 | Caulking around water tank hatch | Yes | Mechanical room (Room 138) | B96, B115, B116 | No | |
| TI1 | Tank insulation | No | Mechanical room (Room 138) | B97, B98, B99 | No | |
| Remainder of Building | | | | | | |
| None | | | | | | |

(*) Denotes a material confirmed as ACBM by QC sample analysis.

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M001 | 12 x 12 floor tile Cream | No | Rooms 203, 204, 206, 208, 212, 213, 215, 217, 238, 266, 268, 270-274, 276, 279, 282, 283 | See Baker's report | Yes | 4,083 sf |
| M002 | Flooring adhesive Black | No | Below M001 | See Baker's report | Yes | 4,083 sf |
| M003 | 12 x 12 floor tile Light green | No | Rooms 212, 213 | See Baker's report | Yes | 466 sf |
| M004 | Flooring adhesive Black | No | Below M003 | See Baker's report | Yes | 466 sf |
| M005 | 12 x 12 floor tile Olive | No | Rooms 209, 210, 269, 277 | See Baker's report | Yes | 980 sf |
| M006 | Flooring adhesive Black | No | Below M005 | See Baker's report | Yes | 980 sf |
| M016 | 12 x 12 floor tile Beige | No | Rooms 232, 242, 244, 246, 249, 253-256, 258-260 | See Baker's report | Yes | 2,480 sf |
| M017 | Flooring adhesive Black | No | Rooms 222, 224, 226-228, 232, 239, 240, 242-246, 249, 253-260 | See Baker's report | Yes | 2,760 sf |
| Third Floor | | | | | | |
| CT3 | 2'x4' white ceiling tile | Yes | Most Third Floor rooms | B43, B83, B87 | No | |
| DW3 | Sheetrock | Yes | Many Third Floor walls | B146, B147, B148 | No | |
| FM12 | Yellow/Black mastic | No | Below FT12 | B41, B42, B88 | Yes | 4,818 sf |
| FM13 | Yellow mastic | No | Below FT13 | B46, B47, B48 | No | |
| FM14 | Black mastic | No | Below FT14 | B49, B50, B51 | Yes | 71 sf |
| FM21 | Yellow/Black mastic | No | Below FT21 | B84, B85, B86 | No | |
| FM22 | Yellow mastic | No | Below FT22 | B90, B91, B92 | No | |
| FM23 | Yellow mastic | No | Below FT23 | B93, B94, B95 | No | |
| FT12 | 12"x12" white floor tile with brown and gray specks | No | Rooms 301, 302, 308-310, 312, 314-322, 329, 337, 339, 341, 344, 354, hallway 358 | B41, B42, B88 | No | |
| FT13 | 12"x12" olive floor tile with white and brown streaks | No | Room 307 | B46, B47, B48 | No | |
| FT14 | 12"x12" olive floor tile with green and white streaks | No | Room 306 | B49, B50, B51 | No | |
| FT21 | 12"x12" tan floor tile with white and brown streaks | No | Hallways 330, 333, 335, 359, 360, room 343 | B84, B85, B86 | No | |
| FT22 | 12"x12" cream floor tile with brown streaks | No | Room 343 | B90, B91, B92 | No | |
| FT23 | 12"x12" tan floor tile with dark brown streaks | No | Room 343 | B93, B94, B95 | No | |
| SK2 | Sink undercoating | No | Rooms 323, 331 | B44, B45, B89 | No | |

FIGURE 1: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 355
FIRST FLOOR

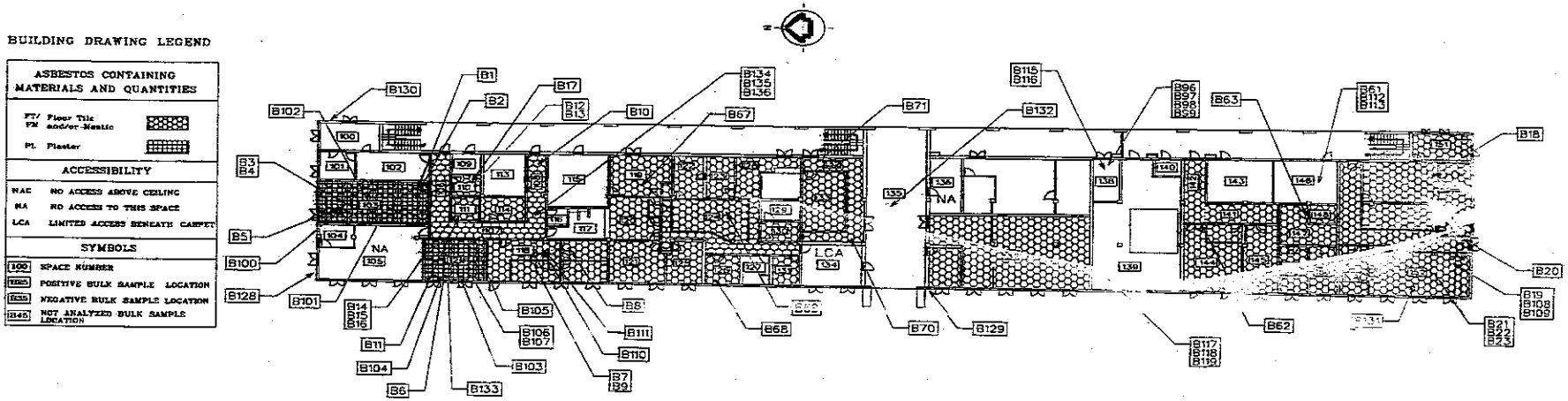


FIGURE 1: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 355
SECOND FLOOR

BUILDING DRAWING LEGEND

| ASBESTOS CONTAINING MATERIALS AND QUANTITIES | |
|---|---|
| FT/FM | Floor Tile and/or Mastic |
| **ACCESSIBILITY** | |
| NAC | NO ACCESS ABOVE CEILING |
| NA | NO ACCESS TO THIS SPACE |
| **SYMBOLS** | |
| 100 | SPACE NUMBER |
| B25 | POSITIVE BULK SAMPLE LOCATION |
| B35 | NEGATIVE BULK SAMPLE LOCATION |
| B45 | NOT ANALYZED BULK SAMPLE LOCATION |

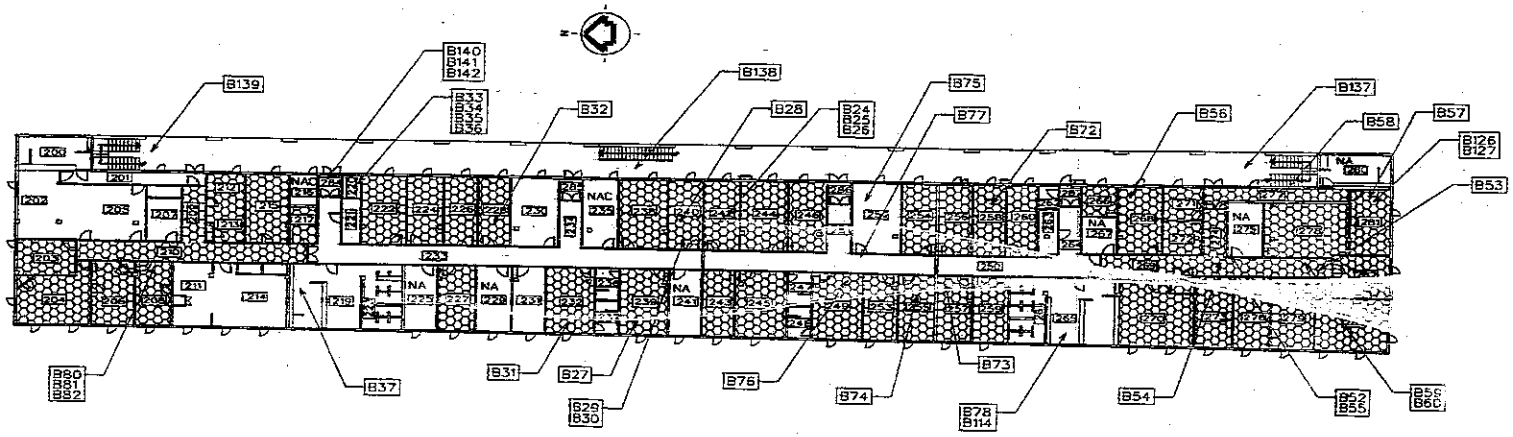


FIGURE 1: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 355
THIRD FLOOR

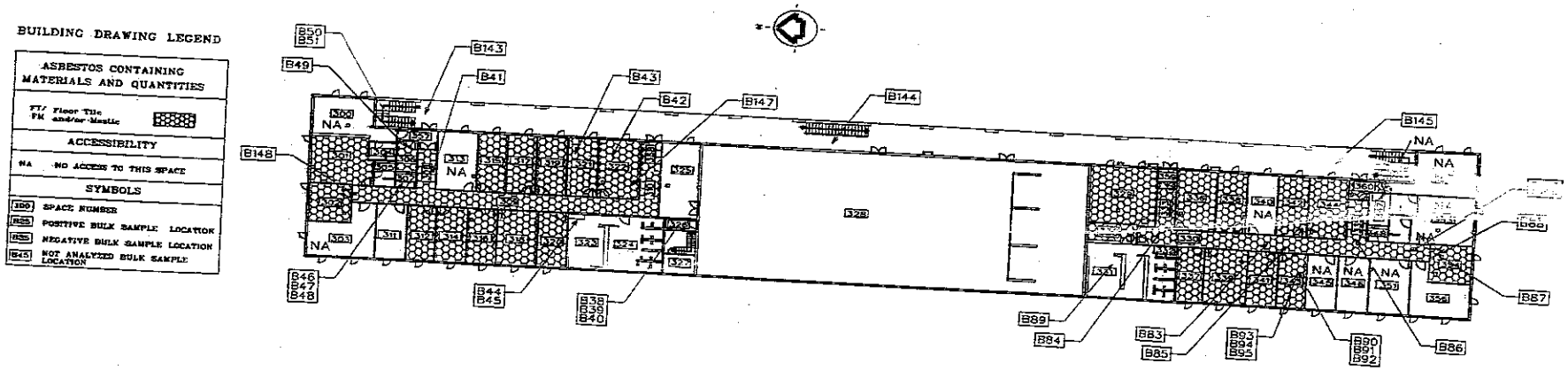
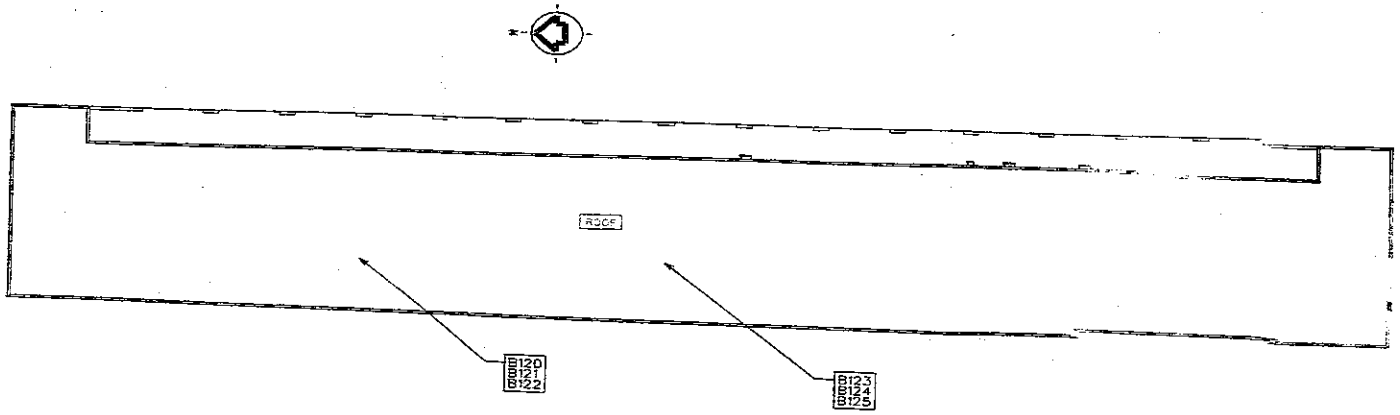


FIGURE 1: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 355
ROOF

BUILDING DRAWING LEGEND

| SYMBOLS | |
|---|---|
| 100 | SPACE NUMBER |
| B35 | NEGATIVE BULK SAMPLE LOCATION |



# 4 Recommendations

Each friable ACBM was assessed and placed in the appropriate AHERA category as specified in 40 CFR, Part 763.88. In addition to the seven AHERA assessment categories, SaLUT added an eighth category for all non-friable ACBM.

SaLUT also categorized the condition of each ACBM at the time of the survey, as follows:

**Good** No damage observed

**Fair** The area of distributed damage was less than 10 percent and greater than 2 percent. The area of localized damage was less than 25 percent and greater than 2 percent.

**Poor** The area of distributed damage was greater than 10 percent and the localized damage was greater than 25 percent.

Based on the AHERA assessment category and SaLUT's condition assessment, SaLUT recommends on or more of the following response actions for each ACBM:

**O&M** Maintain the ACBM. Perform operations and maintenance procedures in a manner that does not damage the material. These procedures are specified in 29 CFR 1926.1101 and HAR 11-502-10. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

**Repair** Damaged areas should be repaired. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

Undamaged and repaired materials are subject to the O&M response action.

**Remove** The material should be removed. Removal must be performed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

If the building is demolished or renovation will impact any ACBMs, those materials must be removed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

Table 2 provides the AHERA assessment category, SaLUT's condition assessment, and SaLUT's recommended response action for each ACBM.

**Table 2. Summary of Asbestos-Containing Materials.**

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| **First Floor** | | | | | | | |
| FM2 Black mastic below FT2 | Below FT2 | 1,363 sf | No | Good | 8 | O&M | 4 |
| FM4 Black mastic below FT4 | Room 118 | 566 sf | No | Good | 8 | O&M | 5 |
| FM5 Black mastic below FT5 | Hallways 128, 141, 142, rooms 114, 118-126, 130, 131, 137, 144, 145, 147-152 | 8,670 sf | No | Good | 8 | O&M | 6 |
| FM6 Black mastic below FT6 | Hallways 106-108, rooms 110, 114, 137, 151, 152 | 3,490 sf | No | Good | 8 | O&M | 7 |
| FM7 Black mastic below FT7 | Room 110 | 69 sf | No | Good | 8 | O&M | 8 |
| FT2 12"x12" brown floor tile with brown specks | Rooms 103, 112, 132, 133 | 1,363 sf | No | Good | 8 | O&M | 4 |
| M026 Flooring adhesive black | Rooms 151, 152 | 1,675 sf | No | Good | 8 | O&M | None |
| M027 12 x 12 floor tile beige | Room 137 | 1,121 sf | No | Good | 8 | O&M | None |
| M028 Flooring adhesive black | Below M027 | 1,121 sf | No | Good | 8 | O&M | None |
| **Second Floor** | | | | | | | |
| FM15 Black mastic below FT15 | Room 281 | 232 sf | No | Good | 8 | O&M | 11 |
| FM16 Yellow/black mastic below FT16 | Below FT16 | 377 sf | No | Good | 8 | O&M | 12 |
| FT16 12"x12" gray floor tile with brown streaks | Room 278 | 377 sf | No | Good | 8 | O&M | 12 |
| M001 12 x 12 floor tile cream | Rooms 203, 204, 206, 208, 212, 213, 215, 217, 238, 266, 268, 270-274, 276, 279, 282, 283 | 4,083 sf | No | Good | 8 | O&M | None |
| M002 Flooring adhesive black | Below M001 | 4, 083 sf | No | Good | 8 | O&M | None |
| M003 12 x 12 floor tile light green | Rooms 212, 213 | 466 sf | No | Good | 8 | O&M | None |
| M004 Flooring adhesive black | Below M004 | 466 sf | No | Good | 8 | O&M | None |
| M005 12 x 12 floor tile olive | Rooms 209, 210, 269, 277 | 980 sf | No | Good | 8 | O&M | None |

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| M006 Flooring adhesive black | Below M005 | 980 sf | No | Good | 8 | O&M | None |
| M016 12 x 12 floor tile beige | Rooms 232, 242, 244, 246, 249, 253-256, 258-260 | 2,480 sf | No | Good | 8 | O&M | None |
| M017 Flooring adhesive black | Rooms 222, 224, 226-228, 232, 239, 240, 242-246, 249, 253-260 | 2,760 sf | No | Good | 8 | O&M | None |
| Third Floor | | | | | | | |
| FM12 Yellow/black mastic below FT12 | Rooms 301, 302, 308-310, 312, 314-322, 329, 337, 339, 341, 344, 354, hallway 358 | 4,818sf | No | Good | 8 | O&M | 9 |
| FM14 Black mastic below FT14 | Room 306 | 71 sf | No | Good | 8 | O&M | 10 |
| PL1 Ceiling plaster | Rooms 103, 112 | 840 sf | No | Good | 8 | O&M | 13 |
| M043 Flooring adhesive Black | Rooms 336-339, 341-344 | 1,740 sf | No | Good | 8 | O&M | None |
| M045 Flooring adhesive Black/yellow | Hallways 330, 333, 335, 359, 360 | 874 sf | No | Good | 8 | O&M | None |

Table 3 provides SaLUT's cost estimate for abating (i.e., removing) each ACBM identified in the building. These estimates are conceptual cost estimates based on standard unit rates for different types of ACBM except for very small abatement projects, where the minimum cost is $1,200. Contractor mobilization/demobilization, transportation, disposal, and other miscellaneous costs are included in the unit. Operations and maintenance (O&M) costs are not provided as part of the recommended response cost.

**Table 3. Asbestos Abatement Cost Estimates.**

| Material Type | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|
| First Floor | | | | |
| FM2 Black mastic below FT2 | Below FT2 | 1,363 sf | 3 | $4,089 |
| FM4 Black mastic below FT4 | Room 118 | 566 sf | 3 | 1,698 |
| FM5 Black mastic below FT5 | Hallways 128, 141, 142, rooms 114, 118-126, 130, 131, 137, 144, 145, 147-152 | 8,670 sf | 3 | 26,010 |
| FM6 Black mastic below FT6 | Hallways 106-108, rooms 110, 114, 137, 151, 152 | 3,490 sf | 3 | 10,470 |
| FM7 Black mastic below FT7 | Room 110 | 69 sf | 3 | 207 |
| FT2 12"x12" brown floor tile with brown specks | Rooms 103, 112, 132, 133 | 1,363 sf | 5 | 6,815 |
| M026 Flooring adhesive black | Rooms 151, 152 | 1,675 sf | 3 | 5,025 |
| M027 12 x 12 floor tile beige | Room 137 | 1,121 sf | 5 | 5,605 |
| M028 Flooring adhesive black | Below M027 | 1,121 sf | 3 | 3,363 |

| Material Type | | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|---|
| Second Floor | | | | | |
| FM15 | Black mastic below FT15 | Room 281 | 232 sf | 3 | 696 |
| FM16 | Yellow/black mastic below FT16 | Below FT16 | 377 sf | 3 | 1,131 |
| FT16 | 12"x12" gray floor tile with brown streaks | Room 278 | 377 sf | 5 | 1,885 |
| M001 | 12 x 12 floor tile cream | Rooms 203, 204, 206, 208, 212, 213, 215, 217, 238, 266, 268, 270-274, 276, 279, 282, 283 | 4,083 sf | 5 | 20,415 |
| M002 | Flooring adhesive black | Below M001 | 4, 083 sf | 3 | 12,249 |
| M003 | 12 x 12 floor tile light green | Rooms 212, 213 | 466 sf | 5 | 2,330 |
| M004 | Flooring adhesive black | Below M004 | 466 sf | 3 | 1,396 |
| M005 | 12 x 12 floor tile olive | Rooms 209, 210, 269, 277 | 980 sf | 5 | 4,900 |
| M006 | Flooring adhesive black | Below M005 | 980 sf | 3 | 2,940 |
| M016 | 12 x 12 floor tile beige | Rooms 232, 242, 244, 246, 249, 253-256, 258-260 | 2,480 sf | 5 | 12,400 |
| M017 | Flooring adhesive black | Rooms 222, 224, 226-228, 232, 239, 240, 242-246, 249, 253-260 | 2,760 sf | 3 | 8,280 |
| Third Floor | | | | | |
| FM12 | Yellow/black mastic below FT12 | Rooms 301, 302, 308-310, 312, 314-322, 329, 337, 339, 341, 344, 354, hallway 358 | 4,818sf | 3 | 14,454 |
| FM14 | Black mastic below FT14 | Room 306 | 71 sf | 3 | 213 |
| PL1 | Ceiling plaster | Rooms 103, 112 | 840 sf | 10 | 8,400 |
| M043 | Flooring adhesive Black | Rooms 336-339, 341-344 | 1,740 sf | 3 | 5,220 |
| M045 | Flooring adhesive Black/yellow | Hallways 330, 333, 335, 359, 360 | 874 sf | 3 | 2,622 |
| Total abatement cost | | | | | $162,813 |

**Analytical Laboratory Sample Results**
**And**
**Chains of Custody**

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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10608
**Report Date:** 12/21/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 16 **# Layers:** 27

**Collected Date:** 12/13/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/20/01
**Received By:** S.Santos
**Received Date:** 12/19/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 355

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B1 | HB01-3744-A | 1st Floor Room 103 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* 0%
*% Other Fibrous Materials:* Trace
**% Non Fibrous Materials:** 100%

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B1 | HB01-3744-B | 1st Floor Room 103 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* 0%
*% Other Fibrous Materials:* 10%
**% Non Fibrous Materials:** 90%

**Sample Comments:**

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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B2 | HB01-3745-A | 1st Floor Room 103 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B2 | HB01-3745-B | 1st Floor Room 103 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 94%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B3 | HB01-3746 | 1st Floor Room 103 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 60% |

*% Other Fibrous Materials:* *75%*

**% Non Fibrous Materials: 25%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B4 | HB01-3747 | 1st Floor Room 103 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 50% |
| Cellulose | 30% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *80%*

**% Non Fibrous Materials: 20%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B5 | HB01-3748-A | 1st Floor Room 112 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Plaster - Soft | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B5 | HB01-3748-B | 1st Floor Room 112 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster - Hard | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *10%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 90%**

Sample Comments: Small amount of chrysotile asbestos found on back side of plaster. Asbestos not in plaster just on surface.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10608
**Report Date:** 12/21/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B6 | HB01-3749-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige/Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B6 | HB01-3749-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B7 | HB01-3750-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

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NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B7 | HB01-3750-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

*% Asbestos: Trace*

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:** <1% Chrysotile asbestos. Found small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B8 | HB01-3751-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos: 0%*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 99%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B8 | HB01-3751-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

*% Asbestos: Trace*

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:** <1% Chrysotile asbestos. Found small amount of black mastic mixed with amber colored mastic.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B9 | HB01-3752 | 1st Floor Room 108 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 50% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B9 | HB01-3753-A | 1st Floor Room 108 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 50% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B10 | HB01-3753-A | 1st Floor Room 111 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B10 | HB01-3753-B | 1st Floor Room 111 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Amber/Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos: Trace*

*% Other Fibrous Materials: 4%*

***% Non Fibrous Materials: 96%***

**Sample Comments:** <1% Chrysotile asbestos found small amount of black mastic mixed with amber coored mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B11 | HB01-3754-A | 1st Floor Room 111 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Drk. Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B11 | HB01-3754-B | 1st Floor Room 111 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: 3%*

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 95%***

**Sample Comments:** Client requested positive stop.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B14 | HB01-3757 | 1st Floor Room 111 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

**Sample Comments:** No mastic on sample.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B15 | HB01-3758-A | 1st Floor Room 111 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B15 | HB01-3758-B | 1st Floor Room 111 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B16 | HB01-3759-A | 1st Floor Room 111 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B16 | HB01-3759-B | 1st Floor Room 111 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *4%*

**% Non Fibrous Materials: 96%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B17 | HB01-3760-A | 1st Floor FT-6 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments: No location on chain of custody used info from sample bag.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10608
Report Date: 12/21/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121301-355-JMV-B17 | HB01-3760-B | 1st Floor FT-6 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic. | Black |

*% Asbestos:* 4%

*% Other Fibrous Materials:* 3%

*% Non Fibrous Materials:* 93%

Sample Comments:

Comments:

Analyst [signature] Date 12/20/01

QC [signature] Date 12/21/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10645
**Report Date:** 12/26/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 23 **# Layers:** 26

**Collected Date:** 12/18/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/24/01
**Received By:** S.Santos
**Received Date:** 12/21/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 355

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B18 | HB01-3885 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Cream |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B19 | HB01-3886 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige/Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B20 | HB01-3887 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B21 | HB01-3888 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B22 | HB01-3889 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B23 | HB01-3890 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B24 | HB01-3891 | 2nd Floor Room 242 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B25 | HB01-3892 | 2nd Floor Room 242 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B26 | HB01-3893 | 2nd Floor Room 242 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B27 | HB01-3894-A | 2nd Floor Room 239 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B27 | HB01-3894-B | 2nd Floor Room 239 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

*% Asbestos:* *Trace*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

**Sample Comments:** <1% Chrysotile asbestos in small amount of black mastic mixed with yellow mastic.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B28 | HB01-3895-A | 2nd Floor Room 240 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B28 | HB01-3895-B | 2nd Floor Room 240 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B29 | HB01-3896-A | 2nd Floor Room 240 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B29 | HB01-3896-B | 2nd Floor Room 240 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastci | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B30 | HB01-3897 | 2nd Floor Room 240 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments: No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B31 | HB01-3898 | 2nd Floor Room 232 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10645
**Report Date:** 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B32 | HB01-3899 | 2nd Floor Room 228 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

***% Other Fibrous Materials:* 85%**

***% Non Fibrous Materials:* 15%**

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B33 | HB01-3900 | 2nd Floor Room 220 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

***% Other Fibrous Materials:* 85%**

***% Non Fibrous Materials:* 15%**

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B34 | HB01-3901 | 2nd Floor Room 220 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials:* *Trace***

***% Non Fibrous Materials:* 100%**

**Sample Comments:**

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B35 | HB01-3902 | 2nd Floor Room 220 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B36 | HB01-3903 | 2nd Floor Room 220 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B37 | HB01-3904 | 2nd Floor Room 219 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 20% |

*% Other Fibrous Materials:* *20%*

***% Non Fibrous Materials:* *80%***

**Sample Comments:** Plyable gray material.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10645
Report Date: 12/26/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B38 | HB01-3905 | 3rd Floor Room 326 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B39 | HB01-3906 | 3rd Floor Room 326 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121801-355-JMV-B40 | HB01-3907 | 3rd Floor Room 326 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plas | Gray |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10645
**Report Date:** 12/26/01

Comments:

**Analyst** _____ **Date** 12/24/01
**QC** _____ **Date** 12/24/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 56 # Layers: 85

Collected Date: 12/19/01
Collected By: Client
TAT: 3 Business Days
Analysis By: S. Wells
Analysis Date: 12/26/01
Received By: S.Santos
Received Date: 12/21/01

Project Name/Location: Quad C - Schofield Barracks - Bldg. 355

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B41 | HB01-3908-A | 3rd Floor Room 308 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: 0%*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B41 | HB01-3908-B | 3rd Floor Room 308 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

**Other Fibrous Materials**

None Detected

*% Asbestos: Trace*

*% Other Fibrous Materials: 0%*

*% Non Fibrous Materials: 100%*

Sample Comments: <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B42 | HB01-3909-A | 3rd Floor Room 322 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B42 | HB01-3909-B | 3rd Floor Room 322 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

*% Asbestos: 3%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

**% Non Fibrous Materials: 92%**

Sample Comments: Black mastic mixed with small amount of yellow mastic.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B43 | HB01-3910 | 3rd Floor Room 321 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials: 85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B44 | HB01-3911 | 3rd Floor Room 323 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 25% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *25%*

**% Non Fibrous Materials: 75%**

**Sample Comments:** Gray Pliable material.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B45 | HB01-3912 | 3rd Floor Room 323 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 30% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *30%*

**% Non Fibrous Materials: 70%**

**Sample Comments:** Gray Pliable Material.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B46 | HB01-3913-A | 3rd Floor Room 307 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B46 | HB01-3913-B | 3rd Floor Room 307 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 95%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B47 | HB01-3914-A | 3rd Floor Room 307 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B47 | HB01-3914-B | 3rd Floor Room 307 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B48 | HB01-3915-A | 3rd Floor Room 307 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B48 | HB01-3915-B | 3rd Floor Room 307 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:*** ***96%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B49 | HB01-3916-A | 3rd Floor Room 306 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Olive Green |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***99%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B49 | HB01-3916-B | 3rd Floor Room 306 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

***% Asbestos: 4%***

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

***% Other Fibrous Materials: 3%***

***% Non Fibrous Materials: 93%***

**Sample Comments:** Client requested positive stop.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B52 | HB01-3919-A | 2nd Floor Room 269 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

***% Asbestos: 0%***

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B52 | HB01-3919-B | 2nd Floor Room 269 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

***% Asbestos: 0%***

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***

***% Non Fibrous Materials: 98%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B53 | HB01-3920 | 2nd Floor Room 269 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Plaster | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 4%

**% Non Fibrous Materials: 96%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B54 | HB01-3921 | 2nd Floor Room 269 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Plaster | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 4%

**% Non Fibrous Materials: 96%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B55 | HB01-3922 | 2nd Floor Room 269 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Plaster | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 3%

**% Non Fibrous Materials: 97%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B56 | HB01-3923 | 2nd Floor Room 268 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 35% |

*% Other Fibrous Materials: 75%*

***% Non Fibrous Materials: 25%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B57 | HB01-3924 | 2nd Floor Room 268 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** Sample was not in group of samples that client relinquished.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B58 | HB01-3925-A | 2nd Floor Room 278 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: 0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B58 | HB01--3925-B | 2nd Floor Room 278 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

***% Asbestos:*** ***Trace***

***% Other Fibrous Materials:*** ***4%***

***% Non Fibrous Materials:*** ***96%***

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B59 | HB01-3926-A | 2nd Floor Room 278 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B59 | HB01-3926-B | 2nd Floor Room 278 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

***% Asbestos:*** ***Trace***

***% Other Fibrous Materials:*** ***2%***

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B60 | HB01-3927-A | 2nd Floor Room 278 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B60 | HB01-3927-B | 2nd Floor Room 278 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B61 | HB01-3928-A | 1st Floor Room 146 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

WHITE ENVIRONMENTAL CONSULTANTS INC.
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FAX: (808) 843-0657

NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B61 | HB01-3928-B | 1st Floor Room 146 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Brown |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B62 | HB01-3929-A | 1st Floor Room 144 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B62 | HB01-3929-B | 1st Floor Room 144 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 2%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials: 4%*

**% Non Fibrous Materials: 94%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B63 | HB01-3930 | 1st Floor Room 147 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B64 | HB01-3931-A | 1st Floor Room 139 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B64 | HB01-3931-B | 1st Floor Room 139 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 95% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *95%*

***% Non Fibrous Materials:*** ***5%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B65 | HB01-3932-A | 1st Floor Room 139 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B65 | HB01-3932-B | 1st Floor Room 139 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Brown |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 95% |

*% Other Fibrous Materials:* *95%*

***% Non Fibrous Materials:* *5%***

**Sample Comments:**

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B66 | HB01-3933-A | 1st Floor Room 139 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B66 | HB01-3933-B | 1st Floor Room 139 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Borwn |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 95% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *95%*

**% Non Fibrous Materials: 5%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B67 | HB01-3934-A | 1st Floor Room 119 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B67 | HB01-3934-B | 1st Floor Room 119 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* *2%*

*% Other Fibrous Materials:* *5%*

**% Non Fibrous Materials: 93%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B68 | HB01-3935 | 1st Floor Room 126 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B69 | HB01-3936 | 1st Floor Room 124 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B70 | HB01-3937-A | 1st Floor Room 132 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B70 | HB01-3937-B | 1st Floor Room 132 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B71 | HB01-3938 | 1st Floor Room 132 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

Sample Comments: No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B72 | HB01-3939 | 2nd Floor Room 258 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

Sample Comments: No mastic on tile.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B73 | HB01-3940 | 2nd Floor Room 257 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B74 | HB01-3941 | 2nd Floor Room 255 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B75 | HB01-3942-A | 2nd Floor Room 252 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B75 | HB01-3942-B | 2nd Floor Room 252 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:*** ***97%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B76 | HB01-3943-A | 2nd Floor Room 249 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B76 | HB01-3943-B | 2nd Floor Room 249 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B77 | HB01-3944 | 2nd Floor Room 233 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B78 | HB01-3945 | 2nd Floor Room 262 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 30% |

*% Other Fibrous Materials:* *30%*

***% Non Fibrous Materials:*** ***70%***

**Sample Comments:** Gray pliable material.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B80 | HB01-3946-A | 2nd Floor Room 208 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B80 | HB01-3946-B | 2nd Floor Room 208 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *3%*

*% Non Fibrous Materials:* *97%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B81 | HB01-3947 | 2nd Floor Room 208 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

Sample Comments: No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B82 | HB01-3948 | 2nd Floor Room 208 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

Sample Comments: No mastic on tile.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B83 | HB01-3949 | 3rd Floor Room 330 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B84 | HB01-3950-A | 3rd Floor Room 330 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: 0%*

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B84 | HB01-3950-B | 3rd Floor Room 330 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos: Trace*

*% Other Fibrous Materials: 4%*

**% Non Fibrous Materials: 96%**

Sample Comments: <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B75 | HB01-3942-B | 2nd Floor Room 252 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B76 | HB01-3943-A | 2nd Floor Room 249 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B76 | HB01-3943-B | 2nd Floor Room 249 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: 0%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

Sample Comments:

WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl., Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B77 | HB01-3944 | 2nd Floor Room 233 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:*** ***15%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B78 | HB01-3945 | 2nd Floor Room 262 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 30% |

*% Other Fibrous Materials:* *30%*

***% Non Fibrous Materials:*** ***70%***

**Sample Comments:** Gray pliable material.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B80 | HB01-3946-A | 2nd Floor Room 208 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl., Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B85 | HB01-3951-A | 3rd Floor Room 330 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B85 | HB01-3951-B | 3rd Floor Room 330 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | Trace |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments: <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B86 | HB01-3952-A | 3rd Floor Room 335 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

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(808) 843-0655
FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B86 | HB01-3952-B | 3rd Floor Room 335 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B87 | HB01-3953 | 3rd Floor Room 354 | 1 of 1 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | White/Tan |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

***% Non Fibrous Materials:* *15%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B88 | HB01-3954-A | 3rd Floor Room 354 | 1 of 2 |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B88 | HB01-3954-B | 3rd Floor Room 354 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 2%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 93%

**Sample Comments:** There is a 50/50 ratio of black & yellow mastic.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B89 | HB01-3955 | 3rd Floor Room 331 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 30% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 30%

**% Non Fibrous Materials:** 70%

**Sample Comments:** Gray pliable material.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B90 | HB01-3956-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* 0%

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials:** 100%

**Sample Comments:**

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B90 | HB01-3956-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B91 | HB01-3957-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B91 | HB01-3957-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

Sample Comments:

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B92 | HB01-3958-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B92 | HB01-3958-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

*% Non Fibrous Materials:* *98%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B93 | HB01-3959-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

Sample Comments:

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FAX: (808) 843-0657

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B93 | HB01-3959-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* *4%*

***% Non Fibrous Materials:* *96%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B94 | HB01-3960-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B94 | HB01-3960-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B95 | HB01-3961-A | 3rd Floor Room 343 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B95 | HB01-3961-B | 3rd Floor Room 343 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B96 | HB01-3962 | Mech. Room 138 1st Floor | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Beige/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 20% |

*% Other Fibrous Materials:* *65%*

***% Non Fibrous Materials:* *35%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10684
**Report Date:** 12/27/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B97 | HB01-3963 | Mech. Room 138 1st Floor | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Cream |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 10% |

***% Other Fibrous Materials:* 50%**

***% Non Fibrous Materials:* 50%**

**Sample Comments:** Note: Sample container was marked B97 & B98.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B98 | HB01-3964 | Mech. Room 138 1st Floor | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Cream |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 40% |
| Cellulose | 10% |

***% Other Fibrous Materials:* 50%**

***% Non Fibrous Materials:* 50%**

**Sample Comments:** Sample container marked B98.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B99 | HB01-3965 | Mech. Room 138 1st Floor | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | Silver/Cream |

***% Asbestos:* 0%**

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 15% |

***% Other Fibrous Materials:* 60%**

***% Non Fibrous Materials:* 40%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10684
Report Date: 12/27/01

Comments:

Analyst [signature] Date 12/26/01
QC [signature] Date 12/27/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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NVLAP 200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10687
**Report Date:** 12/27/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 15 **# Layers:** 20

**Collected Date:** 12/20/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 12/27/01
**Received By:** S.Santos
**Received Date:** 12/21/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 355

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B100 | HB01-3966-A | 1st Floor Room 103 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***99%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B100 | HB01-3966-B | 1st Floor Room 103 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Beige |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

***% Asbestos:*** ***0%***

***% Other Fibrous Materials:*** ***3%***

***% Non Fibrous Materials:*** ***97%***

**Sample Comments:**

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FAX: (808) 843-0657

NVLAP® 200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10687
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B101 | HB01-3967-A | 1st Floor Room 103 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B101 | HB01-3967-B | 1st Floor Room 103 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B102 | HB01-3968 | 1st Floor Room 103 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10687
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B103 | HB01-3969 | 1st Floor Room 112 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 45% |
| Cellulose | 40% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *85%*

**% Non Fibrous Materials: 15%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B104 | HB01-3970 | 1st Floor Room 112 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments: No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B105 | HB01-3971-A | 1st Floor Room 112 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10687
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B105 | HB01-3971-B | 1st Floor Room 112 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *98%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B106 | HB01-3972 | 1st Floor Romm 112 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B107 | HB01-3973 | 1st Floor Room 112 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *99%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10687
**Report Date:** 12/27/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B108 | HB01-3974 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B109 | HB01-3975 | 1st Floor Room 152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B110 | HB01-3976-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* *100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10687
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B110 | HB01-3976-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

*% Asbestos: 2%*

*% Other Fibrous Materials: 4%*

***% Non Fibrous Materials: 94%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B111 | HB01-3977-A | 1st Floor Room 118 | 1 of 2 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: 0%*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B111 | HB01-3977-B | 1st Floor Room 118 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

*% Asbestos: Trace*

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 95%***

**Sample Comments:** <1% Chrysotile asbestos found in small amount of black mastic mixed with yellow mastic.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1284
Client Project#:

Report #: 10687
Report Date: 12/27/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B112 | HB01-3978 | 1st Floor Room 146 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B113 | HB01-3979 | 1st Floor Room 146 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122001-355-JMV-B114 | HB01-3980 | 2nd Floor Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | N/A | Gray |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 30% |

*% Other Fibrous Materials:* *30%*

***% Non Fibrous Materials: 70%***

**Sample Comments:** Gray Pliable material.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1284
**Client Project#:**

**Report #:** 10687
**Report Date:** 12/27/01

Comments:

**Analyst** [signature] **Date** 12/27/01
**QC** [signature] **Date** 12/27/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11254
**Report Date:** 1/29/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012902-355-KWR-B50 | HB02-0417 | 3rd floor room 306 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Olive Green |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** Client requested tile to be tested only.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012902-355-KWR-B51 | HB02-0418 | 3rd floor room 306 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Olive Green |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 99%***

**Sample Comments:** Client requested tile to be tested only.

Comments:

**Analyst** [signature] **Date** 1/29/02
**QC** [signature] **Date** 1/29/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11254
**Report Date:** 1/29/2002

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 4 **# Layers:** 4

**Collection Date:** 1/29/2002
**Collection By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/29/2002
**Received By:** S.Santos
**Received Date:** 1/29/2002

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012902-355-KWR-B12 | HB02-0415 | 1st floor room 111 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***None***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:** Client requested tile to be tested only.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012602-355-KWR-B13 | HB02-0416 | 1st floor room 111 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

***% Asbestos:*** ***None***

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:** Client requested tile to be tested only.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-076
Client Project#: 01-290`

Report #: 10969
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B126 | HB02-0114 | FT-15 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B127 | HB02-0115 | FT-15 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

Comments:

Analyst [signature] Date 1/14/02
QC [signature] Date 1/15/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-076
Client Project#: 01-290`

Report #: 10969
Report Date: 1/14/02

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 3 # Layers: 4

Collected Date: 12/9/01
Collected By: Client
TAT: One week (or more
Analysis By: S. Wells
Analysis Date: 1/14/02
Received By: R.Hamasaki
Received Date: 1/10/02

Project Name/Location: Schofield Barracks Quad C Bldg. 355

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B57 | HB02-0113A | 2nd Floor Room 281 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121901-355-JMV-B57 | HB02-0113-B | 2nd Floor Room 281 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 4%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 91%***

Sample Comments: Client requested positive stop for FT-15.

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B125 | HB02-0135-B | Roof Chimney | 2 of 2 |

**Asbestos**

| None Detected | Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|---|
| | Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

***% Other Fibrous Materials:*** *4%*

***% Non Fibrous Materials:*** *96%*

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 1/15/02

**QC** [signature] **Date** 3-7-02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B124 | HB02-0134-A | Roof Chimney | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Tan/Gray |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B124 | HB02-0134-B | Roof Chimney | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 5% |

***% Other Fibrous Materials: 5%***

***% Non Fibrous Materials: 95%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B125 | HB02-0135-A | Roof Chimney | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Tan/Gray |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 6 **# Layers:** 21

**Collection Date:** 1/4/2002
**Collection By:** Client
**TAT:** One week (or more
**Analysis By:** S. Wells
**Analysis Date:** 1/15/2002
**Received By:** R.Hamasaki
**Received Date:** 1/10/2002

**Project Name/Location:** Schofield Barracks Quad C Bldg. 355
**Building:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B121 | HB02-0130-A | Roof | 1 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Roofing | Black/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 28% |
| Cellulose | 10% |

***% Other Fibrous Materials: 10%***
***% Other Fibrous Materials: 28%***
***% Non Fibrous Materials: 90%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B121 | HB02-0130-B | Roof | 2 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 2% |
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***
***% Other Fibrous Materials: 2%***
***% Non Fibrous Materials: 98%***

**Sample Comments:**

WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl. Unit #301, Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B121 | HB02-0130-C | Roof | 3 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Felt Paper | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 5% |

*% Other Fibrous Materials:* *5%*
*% Other Fibrous Materials:* *25%*
***% Non Fibrous Materials:*** ***95%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B121 | HB02-0130-D | Roof | 4 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 1% |
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*
*% Other Fibrous Materials:* *Trace*
***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B121 | HB02-0130-E | Roof | 5 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 50% |

*% Other Fibrous Materials:* *50%*
*% Other Fibrous Materials:* *20%*
***% Non Fibrous Materials:*** ***50%***

**Sample Comments:**

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2290 Alahao Pl. Unit #301, Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #: H02-076**
**Client Project#:** 01-290

**Report #: 10988**
**Report Date: 1/15/2002**

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B120 | HB02-0131-A | Roof | 1 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Roofing | Black/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 10% |

***% Other Fibrous Materials: 10%***
***% Other Fibrous Materials: 30%***
***% Non Fibrous Materials: 90%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B120 | HB02-0131-B | Roof | 2 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 2% |
| Cellulose | 2% |

***% Other Fibrous Materials: 2%***
***% Other Fibrous Materials: 2%***
***% Non Fibrous Materials: 98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B120 | HB02-0131-C | Roof | 3 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Felt Paper | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 8% |

***% Other Fibrous Materials: 8%***
***% Other Fibrous Materials: 25%***
***% Non Fibrous Materials: 92%***

**Sample Comments:**

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FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-076
Client Project#: 01-290

Report #: 10988
Report Date: 1/15/2002

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B120 | HB02-0131-D | Roof | 4 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 1% |
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* 98%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B120 | HB02-0131-E | Roof | 5 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 50% |

*% Other Fibrous Materials:* *50%*

*% Other Fibrous Materials:* *25%*

***% Non Fibrous Materials:* 50%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B122 | HB02-0132-A | Roof | 1 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Roofing | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 10% |

*% Other Fibrous Materials:* *10%*

*% Other Fibrous Materials:* *30%*

***% Non Fibrous Materials:* 90%**

Sample Comments:

WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Alahao Pl. Unit #301, Honolulu, HI 96819-2283
(808) 843-0655
FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B122 | HB02-0132-B | Roof | 2 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 4% |
| Cellulose | 2% |

*% Other Fibrous Materials:* 2%
*% Other Fibrous Materials:* 4%
**% Non Fibrous Materials:** 98%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B122 | HB02-0132-C | Roof | 3 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Felt Paper | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 10% |

*% Other Fibrous Materials:* 10%
*% Other Fibrous Materials:* 30%
**% Non Fibrous Materials:** 90%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B122 | HB02-0132-D | Roof | 4 of 5 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 3% |
| Cellulose | 2% |

*% Other Fibrous Materials:* 2%
*% Other Fibrous Materials:* 3%
**% Non Fibrous Materials:** 98%

**Sample Comments:**

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FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-076
**Client Project#:** 01-290

**Report #:** 10988
**Report Date:** 1/15/2002

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B122 | HB02-0132-E | Roof | 5 of 5 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Insulation | Brown |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 50% |

***% Other Fibrous Materials:*** ***50%***

***% Other Fibrous Materials:*** ***30%***

***% Non Fibrous Materials:*** ***50%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B123 | HB02-0133-A | Roof Chimney | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Tan/Gray |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials:*** ***Trace***

***% Non Fibrous Materials:*** ***100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010402-355-JMV-B123 | HB02-0133-B | Roof Chimney | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tar | Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

***% Other Fibrous Materials:*** ***4%***

***% Non Fibrous Materials:*** ***96%***

**Sample Comments:**

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NVLAP ID# 200541-0
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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** W. Bradley
**TAT:** 3 Days
**Report No:** 189
**Date Printed:** 2/26/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 21 **Total # of Layer(s):** 21

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B128 | 022202-50 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Front-North **Materials:** Gray Granular Material w/ Paint
**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B129 | 022202-51 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Front-Center **Materials:** Gray Granular Material w/ Paint
**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B130 | 022202-52 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Front-Back **Materials:** Gray Granular Material w/ Paint
**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B131 | 022202-53 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 152 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 5-10%, Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder,Mica, Calcite

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B132 | 022202-54 | 2/26/2002 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 133 **Materials:** Composite Wall Material

**Other Fibrous Materials:** Cellulose 10-20%

**Non-Fibrous Materials:** Calcite, Mica, Gypsum/Binder, Paint

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B133 | 022202-55 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 112 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 20-30%, Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Paint

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B134 | 022202-56 | 2/26/2002 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 107 **Materials:** Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B135 | 022202-57 | 2/26/2002 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 107 **Materials:** Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report [illegible] only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were [illegible]d. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B136 | 022202-58 | 2/26/2002 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 1st Flr, Rm 107 **Materials:** Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B137 | 022202-59 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Lanai-South **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B138 | 022202-60 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Lanai-Center **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B139 | 022202-61 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Lanai-North **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B140 | 022202-62 | 2/26/2002 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Rm 284 **Materials:** Chalky Material w/Paint

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

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The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B141 | 022202-63 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Rm 234 **Materials:** Chalky Material w/Paint

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 3-5%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B142 | 022202-64 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 2nd Flr, Rm 264 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B143 | 022202-65 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Lanai North **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B144 | 022202-66 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Lanai-Center **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B145 | 022202-67 | 2/26/2002 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Lanai-South **Materials:** Granular Material/Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report is only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were obtained. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B146 | 022202-68 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Rm 355 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B147 | 022202-69 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Rm 322 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 5-10%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-355-JSW-B148 | 022202-70 | 2/26/2002 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 355, Quad C **Location:** 3rd Flr, Rm 302 **Materials:** White Composite Dry Wa Material

**Other Fibrous Materials:** Cellulose 10-20%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

Globeteck

**Analyst:** _____

for Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 355, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12.19.01 9:10 am |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121301-355-JMV- | B16 | 1st FLR, Rm 111 | 13 Dec 01 | Accept | |
| 121301-355-JMV- | B17 | | | Reject | need to call drent get location. collected |
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*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method. Client correspondence regarding acceptance criteria or other aspects of analytical request.



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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 355 |
| Project Number: 01-290 | |
| Samples Relinquished by: JMU | Sample Received by: S. Santos |
| Date: 12-19-01 | Date: 12-21-01 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)

**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)

**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121901-355-JMU-B | B18 | 1st Fl. RM152 | 12-19-01 | Accepted | |
| " " " | B19 | 1st Fl. RM152 | | | 72 HR |
| | B20 | " RM152 | | | |
| | B21 | " RM152 | | | |
| | B22 | " " | | | |
| | B23 | " " | | | |
| | B24 | 2nd Fl. RM 242 | | | |
| | B25 | " RM 242 | | | |
| | B26 | " RM 242 | | | |
| | B27 | " RM 239 | | | |
| | B28 | " RM 240 | | | |
| | B29 | " RM 240 | | | |
| | B30 | " RM 240 | | | |
| | B31 | " RM 232 | | | |
| | B32 | " RM 228 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 355 |
| Project Number: 01-290 | |
| Samples Relinquished by: John Veirsch | Sample Received by: S. Santos |
| Date: 12-19-01 | Date: 12.21.01 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121801-355-JMV | B33 | 2nd Fl. Rm 220 | 12-19-01 | A | |
| | B34 | 2nd Fl. Rm 220 | | | |
| | B35 | 2nd Fl. Rm 220 | | | |
| | B36 | 2nd Fl. Rm 220 | | | |
| | 337 | 2nd Fl Rm 219 | | | |
| | B38 | 3rd Fl. Rm 326 | | | |
| | B39 | 3rd Fl. Rm 326 | | | |
| | B40 | 3rd Fl Rm 326 | | | |
| 121901-355-JMV | B41 | 3rd Fl. Rm 308 | | | |
| | B42 | 3rd Fl Rm 322 | | | |
| | B43 | 3rd Fl Rm 321 | | | |
| | B44 | 3rd Fl. Rm 323 | | | |
| | B45 | 3rd Fl. Rm 323 | | | |
| | B46 | 3rd Fl. Rm 307 | | | |
| | B47 | 3rd Fl Rm 307 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:

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2290 Aiahuo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 355 |
| Project Number: 01-290 | |
| Samples Relinquished by: John Veitch | Sample Received by: S. Santos |
| Date: 12-19-01 | Date: 12-21-01 12:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121901-355-JMV | B63 | 1st Fl RM 147 | | X | |
| | B64 | " RM 139 | | | |
| | B65 | " RM 139 | | | |
| | B66 | " RM 139 | | | |
| | B67 | " RM 119 | | | |
| | B68 | " RM 126 | | | |
| | B69 | " RM 124 | | | |
| | B70 | " RM 132 | | | |
| | B71 | " RM 132 | | | |
| | B72 | 2nd Fl RM 258 | | | |
| | B73 | " RM 257 | | | |
| | B74 | " RM 255 | | | |
| | B75 | " RM 252 | | | |
| | B76 | " RM 249 | | | |
| | B77 | " RM 233 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SCLUT | Project Name: Schofield Barracks Bldg 355 |
| Project Number: 01-290 | |
| Samples Relinquished by: John Verch | Sample Received by: S. Santos |
| Date: 12-19-01 | Date: 12-21-01 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R |
|---|---|---|---|---|
| 12401-355-JMV- | B 78 | 2nd Fl Rm 265 | 12-19-01 | A |
| [redacted] | [redacted] | [redacted] | [redacted] | |
| | B 86 | " Rm 208 | | |
| | B 81 | " Rm 208 | | |
| | B 82 | " Rm 208 | | |
| | B 83 | 3rd Fl. Rm 330 | | |
| | B 84 | " Rm 330 | | |
| | B 85 | " Rm 330 | | |
| | B 86 | " Rm 335 | | |
| | B 87 | " Rm 354 | | |
| | B 88 | " Rm 354 | | |
| | B 89 | " Rm 331 | | |
| | B 90 | " Rm 343 | | |
| | B 91 | " Rm 343 | | |
| | B 92 | " Rm 343 | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Schofield Barracks Bldg 355 |
| Project Number: 01-290 | |
| Samples Relinquished by: John Verch | Sample Received by: S. Santos |
| Date: 12-19-01 | Date: 12-21-01 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121901-355-JMV- | B 93 | 3rd Fl RM 343 | 12-19-01 | A | |
| | B 94 | " RM 343 | | | |
| | B 95 | " RM 343 | | | |
| | B 96 | Mech Room 138 1st Fl | | | |
| | B 97 | " " " | | | |
| | B 98 | " " " | | | |
| | B 99 | " " " | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 355, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santa |
| Date: | Date: 12.21-01 12:15 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 122001-355-JMY | B100 | 1st FLR, Rm 103 | 20 Dec 01 | | |
| | B101 | Rm 103 | | | |
| | B102 | Rm 103 | | | |
| | B103 | Rm 112 | | | |
| | B104 | Rm 112 | | | |
| | B105 | Rm 112 | | | |
| | B106 | Rm 112 | | | |
| | B107 | Rm 112 | | | |
| | B108 | Rm 152 | | | |
| | B109 | Rm 152 | | | |
| | B110 | Rm 118 | | | |
| | B111 | Rm 118 | | | |
| | B112 | Rm 146 | | | |
| | B113 | Rm 146 | | | |
| 122001-355-JMY | B114 | 2nd Floor Rm 265 | 12-20-01 | | |

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# Sample Chain of Custody

| | |
|---|---|
| **Client Name:** BLUT | **Project Name:** Schofield Barracks, BLDG 355, Quad C |
| **Project Number:** 01-790 | |
| **Samples Relinquished by:** Tina Perry-Finn | **Sample Received by:** R Hamasaki 浜崎 |
| **Date:** 1/10/02 | **Date:** 01-10-02 @ 11:15 am Thks. |
| **Samples Relinquished by:** | **Sample Received by:** |
| **Date:** | **Date:** |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121901-355-JAN | -B57 | 2nd flr - #281 | 19 Dec 01 | accepted | |
| 121901-355-JAN | -B12C | FT15 | | | |
| 121901-355-JAN | -B17 | FT15 | | | |
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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks, BLDG 355-Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: [illegible] |
| Date: | Date: 1/29/02 12:00P |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R |
|---|---|---|---|---|
| 012902-355-KOR | B12 | 1st FLR, Rm 111 *Test file only* | 29 Jan 02 | |
| | B13 | | | |
| | B50 | 3rd FLR, Rm 306 | | |
| | B51 | | | |

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pg 1 of 3

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544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

022202-

# CHAIN OF CUSTODY

Project Name: Schofield Barracks, BLDG 355 - Quad C
Client: Salut
Project # 01-290
Sampled by: JSW
Sample Date: 02/20/02
Turn Around Time: ~~5 Day~~ 3 Day

ANALYSIS REQUESTED: Asbestos PLM/PCM; Lead Air/Wipe; Lead Paint/Soil; TCLP Pb; TCLP 8 Metals; Arsenic Samples; Total RCRA 8 Metals

| | SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|---|
| 50 | 22002-355-JSW-B128 | 1st FLR, Front North | ✓ | | | | | | |
| 51 | B129 | Center | | | | | | | |
| 52 | B130 | South | | | | | | | |
| 53 | B131 | Rm 152 | | | | | | | |
| 54 | B132 | Rm 133 | | | | | | | |
| 55 | B133 | Rm 112 | | | | | | | |
| 56 | B134 | Rm 107 | | | | | | | |
| 57 | B135 | | | | | | | | |
| 58 | B136 | | | | | | | | |
| 59 | B137 | ~~2nd FLR~~, Lanai - South | ✓ | | | | | | |

| | | |
|---|---|---|
| Relinquished by: [illegible] | Received by: W. Bromley | Relinquished by: |
| Signature: [illegible] | Signature: [illegible] | Signature: |
| Time/Date: 2/22/02 [illegible] | Time/Date: 2/22/02 | Time/Date: |

pg 2 of 3

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

022202

Project Name: SB, BLDG 355 - Quad C
Client:
Project #
Sampled by:
Sample Date: 02/20/02
Turn Around Time:

ANALYSIS REQUESTED: Asbestos PLM/TCM; Lead Air/Wipe; Lead Paint/Soil; TCLP Pb; TCLP 8 Metals; Arsenic Samples; Total RCRA 8 Metals

| | SAMPLE ID | LOCATION |
|---|---|---|
| 60 | 022002-355-JSW-B138 | 2nd FLR, Lanai Center |
| 61 | B139 | North |
| 62 | B140 | Rm 284 |
| 63 | B141 | Rm 234 |
| 64 | B142 | Rm 264 |
| 65 | B143 | 3rd FLR, Lanai North |
| 66 | B144 | Center |
| 67 | B145 | South |
| 68 | B146 | Rm 355 |
| 69 | B147 | Rm 322 |

| | | |
|---|---|---|
| Relinquished by: [illegible] | Received by: | Relinquished by: |
| Signature: [illegible] | Signature: | Signature: |
| Time/Date: 2/22/02 2 Pm | Time/Date: | Time/Date: |

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544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

022202 –

Project Name: SB, BLDG 355 - Quad C
Client:
Project #
Sampled by:
Sample Date: 02/20/02
Turn Around Time:

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 220202-355-JSW-B148 | 3rd FLR, Rm 302 | 1 | | | | | | | |
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|---|---|---|
| Relinquished by: [illegible] | Received by: | Relinquished by: |
| Signature: [illegible] | Signature: | Signature: |
| Time/Date: 2/22/02 @ 10am | Time/Date: | Time/Date: |

**Laboratory Quality Control Results**
**And**
**Chains of Custody**

# Globeteck

NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

## Bulk Asbestos Analysis

### EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 47
**Date Printed:** 1/2/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 2

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 123101-355-JMV-B2 | 123101-06 | 1/2/2002 | 1/2/2002 | 1 of 2 | Chrysotile | Tan | 1-3% |

**Project Name:** Schofield Barracks, Building 355 **Location:** Bldg. 355, 1st Floor, Room 103 **Materials:** Tan Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcareous Matrix, Mica
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 123101-355-JMV-B2 | 123101-06 | 1/2/2002 | 1/2/2002 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Schofield Barracks, Building 355 **Location:** Bldg. 355, 1st Floor, Room 103 **Materials:** Black Mastic
**Other Fiberious Materials:**
**Non Fiberous Materials:** Asphalt/Binder
**Sample Comments:**

Globeteck

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

# Globeteck

NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 49
**Date Printed:** 1/3/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 4 **Total # of Layer(s):** 6

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B38 | 010202-05 | 12/26/2001 | 1/2/2002 | 1 of 2 | Non-Detected | White | N/A |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 326 **Materials:** White Paint
**Other Fiberious Materials:**
**Non Fiberous Materials:** Paint, Calcite, Mica
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B38 | 010202-05 | 12/26/2001 | 1/2/2002 | 2 of 2 | Non-Detected | Gra | N/A |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 326 **Materials:** Gray Plaster
**Other Fiberious Materials:**
**Non Fiberous Materials:** Gypsum, Binder, Calcite, Mica
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B58 | 010202-06 | 12/26/2001 | 1/2/2002 | 1 of 2 | Chrysotile | Tan | 1-3% |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 278 **Materials:** Tan Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcareous Matrix
**Sample Comments:**

Globeteck

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

# Globeteck

NVLAP ID# 200541-0

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| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B58 | 010202-06 | 12/26/2001 | 1/2/2002 | 2 of 2 | Chrysotile | Black | 1-3% |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 278 **Materials:** Black Mastic

**Other Fiberious Materials:**

**Non Fiberous Materials:** Asphalt/Binder

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B78 | 010202-07 | 12/26/2001 | 1/2/2002 | 1 of 1 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 265 **Materials:** Gray Mastic

**Other Fiberious Materials:** Cellulose 10-20%

**Non Fiberous Materials:** Calcite Mica

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121801-355-JMV-B96 | 010202-08 | 12/26/2001 | 1/2/2002 | 1 of 1 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 355 **Location:** Bldg. 355, Room 138 **Materials:** Fibrous Material

**Other Fiberious Materials:** Mineral Wool 30-40%

**Non Fiberous Materials:** Glue Binder, Glass Beads, Calcite

**Sample Comments:**

Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

Globeteck NVLAP NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** Client
***TAT:*** 5 Days
***Report No:*** 85
***Date Printed*** 1/15/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 1 ***Total # of Layer(s):*** 1

| *Client ID* | *Lab ID* | *Received Date* | *Date Analyzed* | *Layer* | *Asbestos Type* | *Color* | *Percent* |
|---|---|---|---|---|---|---|---|
| 010402-355-JMV-B121 | 011102-65 | 1/14/2002 | 1/14/2002 | 1 of 1 | None Detected | Black | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg 355, Quad C, Roof **Materials:** Black Roofing Material

**Other Fibrous Materials:** Cellulose1-3% Fibrous Glass 20-30%
**Non-Fibrous Materials:** Asphalt/Binder, Perlite, Mica

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Schofield Barracks Bldg 355
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-13-01
Turn Around Time: 72 hours

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 23101-06 12-13-01-~~355~~ JMV-B2 | 1st Floor, Rm 103 | ✓ | | | | | | | |
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|---|---|---|
| Relinquished by: John Vertch | Received by: G. Imamura | Relinquished by: |
| Signature: | Signature: G Imamura | Signature: |
| Time/Date: 12/19/01 | Time/Date: 1/2/02 | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Bldg # 355 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-19-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED: Asbestos PLM/PCM (circled), Lead Air/Wipe, Lead Paint/Soil, TCLP Pb, TCLP 8 Metals, Arsenic Samples, Total RCRA 8 Metals

| | SAMPLE ID | LOCATION | | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|---|---|
| D202-05 | 121801-355-JMV | - B38 | Rm 326 | ✓ | | | | | | |
| 06 | ↓ | B58 | Rm 278 | ↓ | | | | | | |
| 07 | ↓ | B78 | Rm 265 | ↓ | | | | | | |
| 08 | ↓ | B96 | Rm 138 | ✓ | | | | | | |

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 12/26/01 | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Quad C, Schofield Barracks, Bldg 355
Client: SaLUT
Project # 01-290 Schofield Barracks
Sampled by: JMV
Sample Date: ~~10-4-02~~ 1/1/01
Turn Around Time: 5 days

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 011102-65 010402-355-JMV-B121 | Roof | X | | | | | | | |
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| Signature: | Signature: | Signature: |
| Time/Date: | Time/Date: | Time/Date: |

# AMA Analytical Services, Inc.

Electron & Optical Microscopy Services

NVLAP
NY ELAP
AIHA

## CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| **Client:** | SaLUT, Inc. | **Job Name:** | Schofield Barracks | **Chain Of Custody:** | 92214 |
| **Address:** | 11609 Edmonston Road | **Job Location:** | Building 355 - Quad C | **Date Analyzed:** | 04/30/2002 |
| | Beltsville, Maryland 20705 | **Job Number:** | 01-290 | **Person Submitting:** | Ken Reynolds |
| | | **P.O. Number:** | Not Provided | | |

**Attention:** Tina Perry-Finau



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0244052 | 121301-355-JMV-B2 | 2 | 2 | – | – | – | – | – | – | – | – | 98 | Off-White | LB | |
| 0244053 | 121801-355-JMV-B38 | NAD | – | – | – | – | – | – | – | – | – | 100 | Multi | LB | |
| 0244054 | 121901-355-JMV-B58 | TR [1] | TR | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |
| 0244055 | 121901-355-JMV-B78 | NAD | – | – | – | – | – | – | 10 | – | – | 90 | Gray | LB | |
| 0244056 | 121901-355-JMV-B96 | NAD | – | – | – | – | 40 | – | – | – | – | 60 | Gray | LB | |

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Luis Bustillos

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the acc[illegible] and completeness of this information. Residual sample material will be discarded in ac[illegible]dance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to pola[illegible] light microscopy of bulk samples and transmission electron microscopy of AHERA air s[illegible]. All rights reserved. AMA [illegible]ytical Services, Inc.

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**AMA Analytical Services, Inc.**

Electron & Optical Microscopy Services

NVLAP
NY ELAP
AIHA

# CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| Client: | SaLUT, Inc. | Job Name: | Schofield Barracks | Chain Of Custody: | 92202 |
| Address: | 11609 Edmonston Road | Job Location: | Building 355 | Date Analyzed: | 03/06/2002 |
| | Beltsville, Maryland 20705 | Job Number: | 01-290 | Person Submitting: | Tina Perry-Finau |
| | | P.O. Number: | Not Provided | | |



Attention: Tina Perry-Finau

## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0233234 | 022002-355-JSW-B141 | NAD | – | – | – | – | – | – | 3 | – | – | 97 | Gray | RRW | |

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Robert Workman

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in accordance with the appropriate regulatory guidelines, unless otherwise requested by the client. NVLAP Accreditation applies only to polarized light microscopy of bulk samples and transmission electron microscopy of AHERA air samples. All rights reserved. AMA Analytical Services, Inc.

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# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 92202

**MAILING ADDRESS:**

1. Submittal Date: _____ Job Name/location: Schofield Barracks
2. Client Name: SOLUT, Inc. (Honolulu) Job #: 01-290 P.O. #: _____
3. Street/RFD/P.O. Box: 835 Koapaka Street #3286 Bill To: SOLUT, Inc.
4. City, State, Zip: Honolulu, Hawaii 96819 Phone #: 8088836155
5. Contact Person: Lina Ray-Fuaiy Submitted By: Lina Ray-Fuaiy (Print) (Signature)
6. DATE & TIME RESULTS REQUIRED: 03 / 04 / 00 Time: 1:00 PM ☐ IMMEDIATE ☐ 24HR ☑ 48HR ☐ 72HR ☐ 5-DAY OTHER(Specify): _____

**SAMPLE DATA:**

1. Analysis Type: ☑ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☑ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify): _____
2. Total Number Of Samples: TEM _____ PCM _____ PLM _____ LEAD _____ OTHER (Specify) _____
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: ☐ PC ☐ MCE ☐ B. Pore Size: _____ Micron C. Diameter: ☐ 13/mm ☐ 25mm
4. LEAD SAMPLES: Wipe Type: ☐ Paper ☐ Paint ☐ Ghost ☐ Cyclo products ☐ Other(specify) _____
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☐ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | ANALYSIS: TEM | PCM | PLM | LEAD | OTHER | MATRIX: AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01200 | 355-[illegible] | [illegible] | [illegible] | | | | ✓ | | | | | | | | |
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**REPORTING DATA:**

1. Verbal Results To Whom? Name: _____ Phone: _____ Beeper: _____
2. Date Written Results Required ____ / ____ / ____

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 3 / 4 / 00 @ [illegible] By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: 3 / 4 / 00 @ [illegible] By (Print): [illegible] Sign: [illegible]
3. Results Reported To: _____ Date: _____ Time: _____ Init: _____
4. Comments: _____

**AMA Analytical Services, Inc.**

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(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 9[illegible].14

**MAILING ADDRESS:**

1. Submittal Date: 29 MAR 02
2. Client Name: SALUT
3. Street/RFD/P.O. Box: 3375 Koapaka St. STE B256
4. City, State, Zip: Hon. Hi. 96819
5. Contact Person: Tina Perry-Finau

Job Name/location: Schofield Barracks, BLDG 355 - Quad C
Job #: 01-290 P.O. #:
Bill To: SALUT
Phone #: 808-~~[illegible]~~ 833-6155 Fax: 808-833-6156
Submitted By: Ken Reynolds (Print) Ken Reynold (Signature)

6. DATE & TIME RESULTS REQUIRED: 4/30/02 Time 1200 AM PM ☐ IMMED. ☐ 24HR ☐ 48HR ☐ 72HR ☒ 5-DAY OTHER (Specify):

**SAMPLE DATA:**

1. Analysis Type: ☒ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☒ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify):
2. Total Number Of Samples: TEM ____ PCM ____ PLM 5 LEAD ____ OTHER (Specify)
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: PC ☐ MCE ☐ B. Porosity: ____ Micron C. Diameter ☐ 37mm ☐ 25mm
4. LEAD SAMPLES: Wipe Type: ☐ Face ☐ Palmtest ☐ Ghost ☐ Tyne Products ☐ Other (specify)
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☒ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION** / **ANALYSIS** / **MATRIX**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | TEM | PCM | PLM | LEAD | OTHER | AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 121301-355-JMV-B2 | | 1st FLR, Rm 103 | 12/13/01 | | | | | | | | | | | | |
| 121801-355-JMV-B8 | | 3rd FLR, Rm 326 | 12/18/01 | | | | | | | | | | | | |
| 121901-355-JMV-B58 | | 2nd FLR, Rm 278 | 12/19/01 | | | | | | | | | | | | |
| 121901-355-JMV-B78 | | 2nd FLR, Rm 265 | | | | | | | | | | | | | |
| 121901-355-JMV-B96 | | 1st FLR, Rm 138 | | | | | | | | | | | | | |

**REPORTING DATA:**

1. Verbal Results To Whom? Name: ____ Phone: ____ Beeper: ____
2. Date Written Results Required ____/____/____

**LABORATORY STAFF ONLY: (CUSTODY)**

1. Date/Time RCVD: 4/30/02 [illegible] Sign: [illegible]
2. Date/Time Analyzed: 4/30/02 [illegible] Sign: [illegible]
3. Results Reported To: [illegible] Date: 4/30/02 Time: ____ Initials: [illegible]
4. Comments:

ATTACHMENT 22

BLDG 356

# Schofield Barracks

# Building 356

# Executive Summary

Soil and Land Use Technology, Inc. (SaLUT) performed an asbestos identification and assessment reinspection of Building 356 located at Schofield Barracks, Hawaii. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 356 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii) were included to the extent that the suspect materials found in those surveys could be identified. The survey was conducted by SaLUT in accordance with the U.S. Army Corps of Engineers Honolulu Engineer District Scope of Work dated September 18, 2001. The survey was conducted between December 3, 2001 and March 7, 2002.

All accessible areas of the building were inspected for suspect asbestos-containing building materials (ACBMs). One hundred and forty-four samples of suspect asbestos containing material were collected. Analytical results confirmed that asbestos is present as floor tile and floor tile mastic. A summary of the ACBMs encountered is provided on the next page. This report provides a detailed description of the ACBM locations, quantities, and hazard assessments based on conditions existing at the time of the inspection. No areas were found to contain ACBM causing high or imminent exposure potential.

*Photograph 1. Front of Building 356.*

*Photograph 2. Rear of Building 356.*

## BUILDING SUMMARY

| | |
|---|---|
| **Facility** | Schofield Barracks |
| **Building** | 356 |
| **Inspector(s)** | John Willard, Kenneth Reynolds, John Veitch |
| **Inspection Date(s)** | December 3, 2001 through March 7, 2002 |
| **Building Area** | 75,000 s.f. |

**Inaccessible areas (overview)**

None

**Areas with limited access (overview)**

None

**Areas with no access (overview)**

Above ceilings with no access ("NAC" on building drawings)
Rooms that were sealed ("NA" on building drawings)

| Types of ACBMs Encountered | | Approximate Quantity |
|---|---|---|
| **Thermal System Insulation** | None | |
| **Surfacing** | None | |
| **Miscellaneous** | Floor tile<br>Floor tile mastic | 15,128 s.f.<br>41,023 s.f. |
| **Functional Areas with High to Imminent Exposure Potential** | None | |

*Photograph 3. Side of Building 356.*

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# 1 Introduction

SaLUT performed an inspection of Building 356 to identify and assess all accessible ACBMs. This was a reinspection conducted between December 3, 2001 and March 7, 2002, in accordance with the requirements outlined in the Scope of Work dated September 18, 2001. The results of the original survey conducted in July and August 1993 (*Asbestos Survey and Management Plan Report for Building 356 of Quad C at the Schofield Barracks Military Reservation, Hawai'i*, Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter) and a survey of limited scope conducted in 2000 (*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawai'i*, Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawai'i) were included.

The following is a description of the building:

| | |
|---|---|
| **Function** | Barracks |
| **Size** | 75,000 square feet; three floors |
| **Foundation** | Concrete |
| **Exterior walls** | Concrete masonry units with plaster coating |
| **Roof** | Metal |
| **Mechanical systems** | Main mechanical room containing furnace and boiler on First Floor; secondary mechanical rooms on Second and Third Floors; pipes are insulated with rubber and foam |
| **Climate control** | Central heating system; individual room air conditioning units; ducts are insulated with fiberglass |
| **Interior walls** | Concrete masonry units, drywall |
| **Floors** | Floor tile, concrete, ceramic tile |
| **Ceilings** | Ceiling tiles; fixed ceilings with ceiling plaster in some spaces |

Survey and assessment protocols were based on those adopted by the U.S. Environmental Protection Agency (EPA) as detailed in the Asbestos Hazard Emergency Response Act (AHERA; 40 CFR 763, Subpart E), and those of the Hawaii Department of Health in Hawaii Administrative Rule (HAR) 11-502 *Asbestos-Containing Materials in Schools*. In addition to identifying materials considered suspect by AHERA survey protocols, accessible roofing and other exterior materials were also addressed. SaLUT's inspectors identified and sampled all materials considered to be suspect under the regulations and other documents listed in Section 2 *Applicable Documents*, as well as those materials that have been found through other available literature and inspectors' experience (e.g., leveling paper and silver exterior paint) to potentially contain asbestos. This report does not address those suspect materials that would be expected in the building (e.g., sink undercoating in bathrooms of a residence)but were not encountered; the reader should assume that, if a suspect material is not mentioned in Section 3 *Findings*, the material was not found in the building.

For the following reasons, SaLUT's survey differed from a normal reinspection, wherein the locations and conditions of previously identified ACBMs are verified, and the impacts of building renovations are determined:

- **Inability to identify the Baker survey's homogeneous materials with certainty.** Photographs of the positive materials were not included in the Baker inspection report available at the Directorate of Public Works (DPW). Many of the types of floor tile in the original survey were described by their predominant color only. Other types of floor tile appear to have received more than one description (possibly due to having been described by different inspectors).

- **Multiple layers of floor tile.** Many rooms had multiple layers of floor tile. Numerous instances were identified where floor tile located in the 1993 survey had been covered by other types of tile. This made it impractical to carry out the following tasks with completed accuracy:
  - Verify all locations of floor tiles identified in the original survey
  - Quantify types of floor tile
  - Identify all types of floor tile in the building (it was assumed that all types of floor tile were visible in at least one location)

To deal with these issues, under the direction of SaLUT's Project Manager and Principal Investigator, the inspectors modified the survey protocol as follows:

- **Floor tile.** Where a floor tile type could be sampled by SaLUT's inspectors without causing unacceptable damage, the original inspection was ignored, the floor tile was given a SaLUT homogeneous material identification, and the floor tile was sampled in accordance with the SAP. If the material could be equated to a type of Baker floor tile, this was noted. Where older types of floor tile were noted below SaLUT's samples, but the older materials could not be sampled, the floor tile and associated mastic were identified from the material locations in Baker's report.

- **Other materials identified in previous inspections.** For all other materials (including those that were determined to not contain asbestos) that had been identified in the previous inspections, SaLUT's inspectors attempted to locate the materials. In a number of cases, the materials had been abated during various renovation projects. Where a material was identified, the SaLUT's lead inspector determined whether additional sampling was warranted.

  The DPW survey identified one positive material (white caulk on a duct above the ceiling of Room 326) not identified in the Baker survey. No photograph of this positive material was included in the inspection report. SaLUT's inspectors were unable to locate this material. It is possible that the material was abated.

- **Other materials not identified in previous inspection.** SaLUT's inspectors identified and sampled a number of suspect materials (e.g., types of caulking) that were not identified previously.

- ❑ **Ceiling Tile.** A number of samples were taken by SaLUT to confirm Baker's results that all no ceiling tiles contained asbestos. At that point, SaLUT stopped sampling ceiling tile and Baker's inspection results were accepted.

All samples were collected in accordance with the Sampling and Analysis Plan (SAP) for the task except as noted above. Where applicable, corners of wall-to-wall carpeting were lifted to examine flooring materials under the carpet. Metal roofs that would not support the inspector's weight were examined visually; if suspect materials were identified they were presumed to contain asbestos unless they could be sampled from an accessible edge of the roof. These situations, as well as other special situations, are discussed in the SAP located in Appendix A of this volume.

On-site inspection and assessments were conducted by John Willard, Kenneth Reynolds, and John Veitch, EPA and State of Hawai'i accredited Asbestos Inspectors. Quality control review was conducted by Dr. David M. Heisler (Principal Investigator).

# 2 Applicable Documents

The following are the regulations, standards, and other documents applicable to the survey:

**U.S. Army Publications**

| | |
|---|---|
| AR 200-1 | Environmental Protection and Enhancement |
| AR 385-40 | Accident Reporting and Records |
| EM 385-1-1 | USACE, Safety and Health Requirements Manual, 3 Sep 96 |
| AR-420-70 | Building and Structures |
| TB 420-70-8 | Asbestos Survey and Abatement |

**Title 29 Code of Federal Regulations, U.S. Department of Labor, Occupational Safety and Health Administration Standards**

| | |
|---|---|
| Part 1910.20 | Access to Employee Exposure and Medical Records |
| Part 1910.95 | Occupational Noise Exposure |
| Part 1910.134 | Respiratory Protection |
| Part 1910.1000 | Air Contaminants — Permissible Exposure Limits |
| Part 1910.1001 | Asbestos |
| Part 1910.1200 | Hazard Communication |
| Part 1926.59 | Hazard Communication Construction |
| Part 1926.1101 | Asbestos in Construction |

**Title 40 Code of Federal Regulations, Environmental Protection Agency Standards**

| | |
|---|---|
| Part 61 Subpart A | National Emission Standards for Hazardous Air Pollutants |
| Part 763 | Asbestos Hazard Emergency Response Act |

**American National Standards Institute Standards**

| | |
|---|---|
| Z9.2-1979 | Fundamentals Governing the Design and Operation of Local Exhaust Systems |
| Z88.20-1988 | Practices for Respiratory Protection |

**U.S. Environmental Protection Agency Guidelines**

| | |
|---|---|
| EPA/600/R-93/116 | Method of the Determination of Asbestos in Bulk Building Materials |
| EPA/5605-85-024 | Guidance for Controlling Asbestos Containing Building Materials |

**Underwriters Laboratories, Inc. Publications**

| | |
|---|---|
| 586-77 (R-1982) | Test Performance of High Efficiency Particulate Air Filter Units |

**State of Hawai'i Occupational Safety and Health Standards**

| | |
|---|---|
| HIOSH 12-145 | Asbestos in Construction |

**Hawai'i Administrative Rules**

| | |
|---|---|
| Chapter 11-501 | Asbestos Requirements |
| Chapter 11-502 | Asbestos Containing Materials in Schools |
| Chapter 11-503 | Fees for Asbestos Removal and Certification |
| Chapter 11-504 | Asbestos Abatement Certification Program |

**USAED, Honolulu Contractual Documents**

| | |
|---|---|
| Contract DACA83-01-D-0017 | Indefinite-Delivery Indefinite-Quantity (IDIQ) Services Contract for Asbestos/Lead Survey and Abatement Services for Honolulu Engineer District (HED) Area of Responsibility, 14 September 2001 |
| Contract DACA83-01-D-0017<br>Task Order 0001<br>Scope of Work | Asbestos Survey for Various Buildings at Pohakuloa Training Area, Wheeler Army Airfield, Fort Shafter, Tripler Army Medical Center, Waianae Recreational Center, Pohakuloa Training Area and Kiluea Military Reservation, Hawaii |

**Previous Asbestos Surveys**

*Asbestos Survey and Management Plan Report for Building 356 of Quad C at the Schofield Barracks Military Reservation, Hawaii,* Baker Environmental, Inc. for the Corps of Engineers, Fort Shafter

*Asbestos Survey for Quad C Buildings 355, 356, 357, 358 Renovation Project Schofield Barracks, Oahu, Hawaii,* Environmental Division, Directorate of Public Works, U.S. Army Garrison Hawaii

# 3 Findings

Seventy-seven homogeneous materials suspected of potentially containing asbestos were identified and sampled by SaLUT. SaLUT also identified, but did not sample, an additional 30 types of floor tile and mastic that were found to be ACBM by Baker. SaLUT collected 144 bulk asbestos samples that were analyzed by White Environmental Consultants, Inc. and Globeteck at their National Voluntary Laboratory Accreditation Program (NVLAP) - accredited laboratories in Honolulu using polarized light microscopy/dispersion staining (PLM/DS) techniques. For some homogeneous materials, the laboratories used a *stop on positive* procedures, whereby if one sample was confirmed as ACBM, the remaining samples were not analyzed. Composite samples of floor tile and floor tile mastic were split and the two components were analyzed individually as required by AHERA regulations. Therefore, the number of samples collected differs from the number of analyses. SaLUT submitted duplicates of ten of the samples analyzed by White to Globeteck for quality control analysis. One layer (floor tile) of one sample (B19) was found by Globeteck to be ACBM.

As a result of these laboratory analyses, 20 homogeneous materials (two types of floor tile and eighteen types of floor tile mastic) were confirmed as ACBM by sample analysis, in addition to the 30 types of asbestos-containing floor tile and mastic identified by Baker, which remain in the building. The condition of the encountered positive materials was good, although some floor tiles are broken. Photographs 4 through 21 illustrate the ACBMs sampled by SaLUT. SaLUT was unable to photograph the ACBMs identified by Baker because they located below underneath floor tile sampled by SaLUT and were only revealed in the small areas where SaLUT's samples were taken.

Baker indicated that plaster on the exterior of one floor was ACBM. Anecdotal evidence from various sources mentions occasional plaster samples from the exteriors of Quad buildings that were ACBM. However, As was the case for SaLUT's plaster samples, all of Baker's plaster samples (including interior plaster) from Quad C contained either no asbestos or less than 1 percent asbestos. Therefore, under AHERA and SaLUT's SAP, none of the plaster is ACBM.

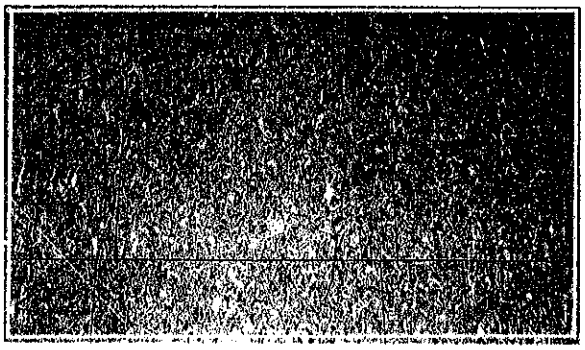
All identified homogeneous materials considered to be potentially asbestos containing ("suspect") are listed on the *Homogeneous Materials Listing* (Table 1). These materials are grouped according to class (i.e., miscellaneous, surfacing, and thermal system insulation) and floor of the building. For each suspect material, the friability, general locations in the building, and sample numbers are indicated, as well as whether the material was determined to be ACBM or not. Red sample numbers indicate those samples that contained asbestos. Gray sample numbers indicate samples that were not analyzed because another sample of the same material contained asbestos. Suspect materials identified as ACBM by quality control analysis are identified by an asterisk (*) following the appropriate sample number. The ACBMs identified by Baker and not sampled by SaLUT are listed following SaLUT's homogeneous materials.

Sample collection sites for identified suspect ACBMs, as well as locations of identified ACBMs, are indicated on the building drawings (Figure 1).

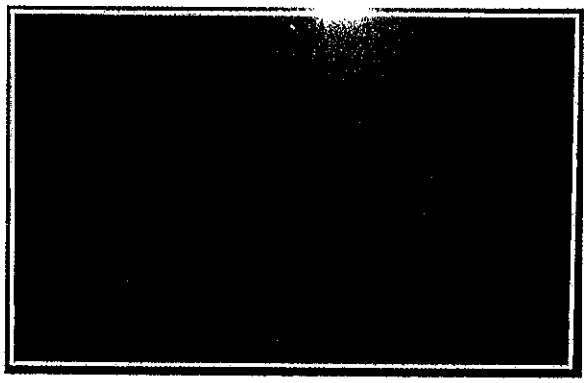
Table 2, *Summary of Asbestos-Containing Materials,* provides a summary of the encountered ACBMs in the building. Each material is listed with information regarding the type, location, and condition of the ACBM, along with the recommended response action for the material.

Laboratory analysis sheets for all samples collected by SaLUT, including the quality control analyses, are located at the end of this report. Laboratory analysis sheets for samples collected during the previous surveys are found in those reports.

*Photograph 4. FM1. The mastic (FM1) below this floor tile (FT1) contains asbestos. The floor tile does not contain asbestos.*



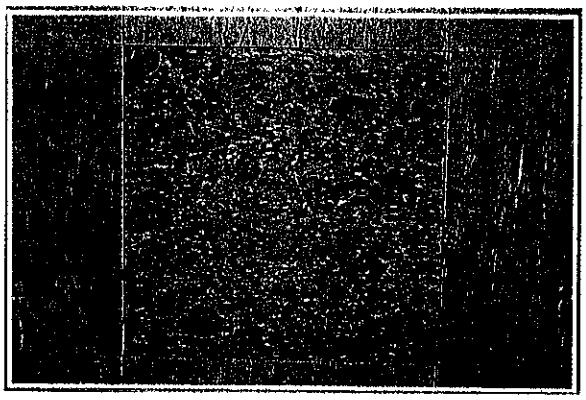
*Photograph 5. FM2. The mastic (FM2) below this floor tile (FT2) contains asbestos. The floor tile does not contain asbestos.*



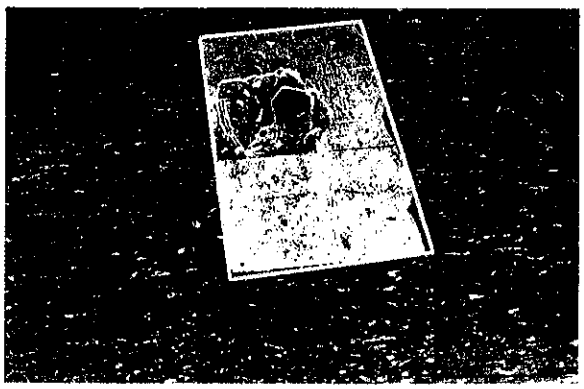
*Photograph 6. FM5. The mastic (FM5) below this floor tile (FT5) contains asbestos. The floor tile does not contain asbestos.*

*Photograph 7. FM6. The mastic (FM6) below this floor tile (FT6) contains asbestos. The floor tile does not contain asbestos.*

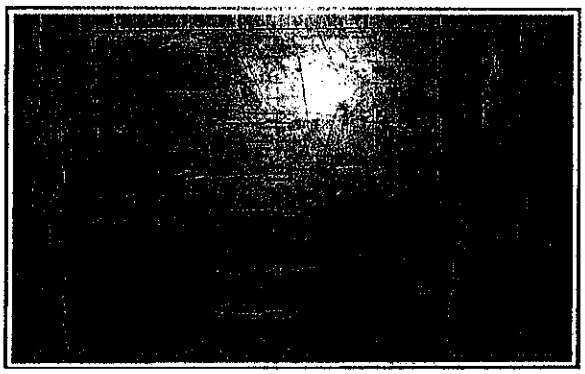
*Photograph 8. FM9 and FM24. This floor tile (FT9) on the First Floor is the same as FT24 on the Second Floor. The mastics below both floor tiles contain asbestos. Neither of the floor tiles contains asbestos.*



*Photograph 9. FM10. The mastic (FM10) below this floor tile (FT10) contains asbestos. The floor tile does not contain asbestos.*

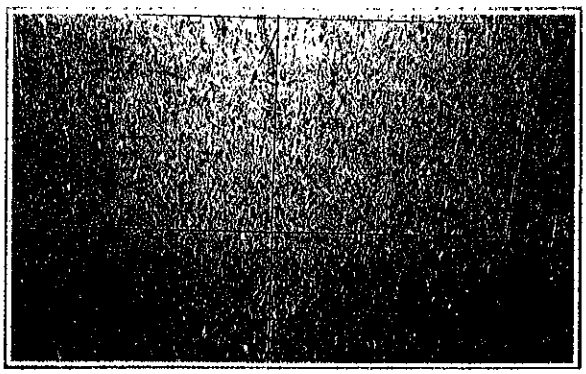


*Photograph 10. FM11. The mastic (FM11) below this tan floor tile (FT11) contains asbestos. The floor tile does not contain asbestos.*

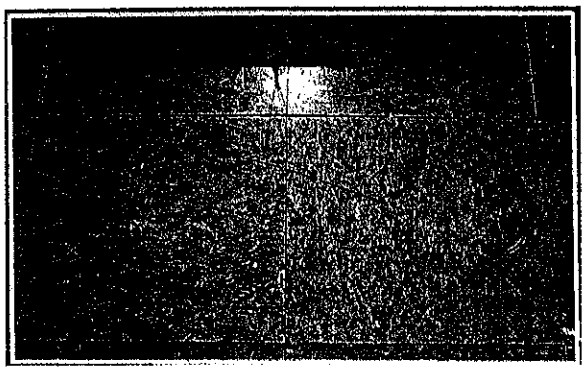


*Photograph 11. FM12. The mastic (FM12) below this floor tile (FT12) contains asbestos. The floor tile does not contain asbestos.*

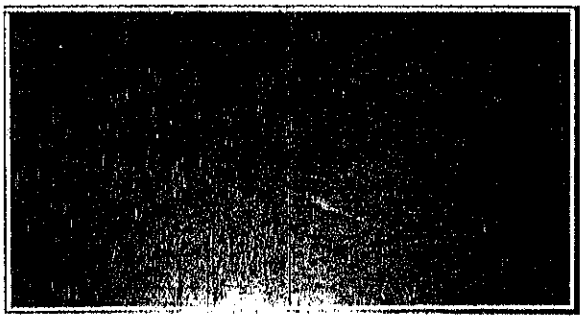
*Photograph 12. FM14. The mastic (FM14) below this floor tile (FT14) contains asbestos. The floor tile does not contain asbestos.*



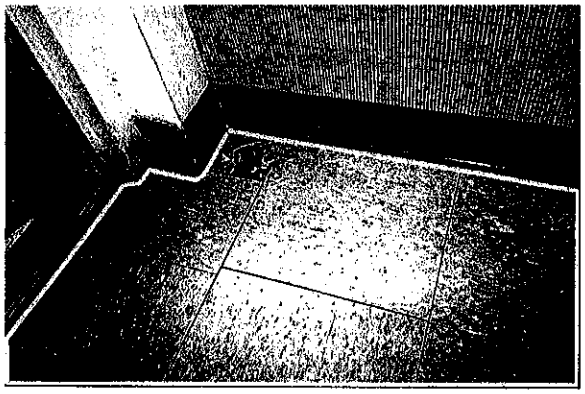
*Photograph 13. FM15. The mastic (FM15) below this floor tile (FT15) contains asbestos. The floor tile does not contain asbestos.*



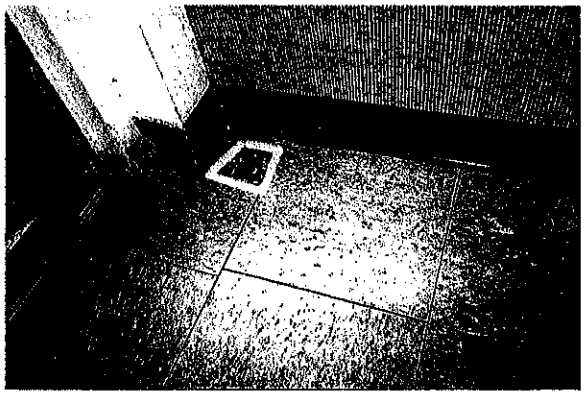
*Photograph 14. FM16. The mastic (FM16) below this floor tile (FT16) contains asbestos. The floor tile does not contain asbestos.*



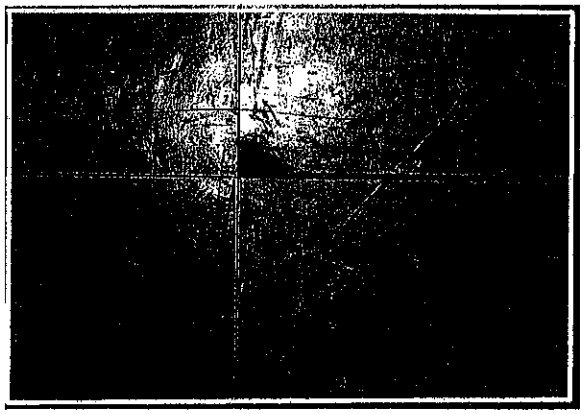
*Photograph 15. FM17. The mastic (FM17) below this floor tile (FT17) contains asbestos. The floor tile does not contain asbestos.*



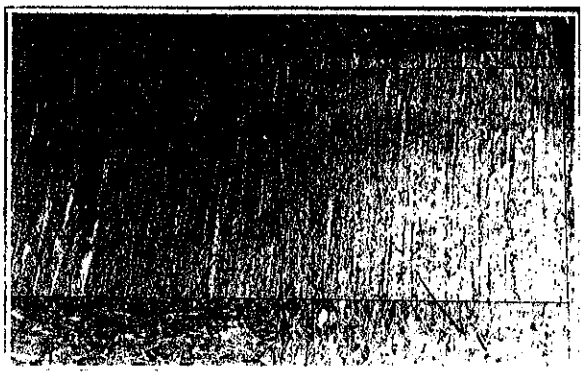
*Photograph 16. FM18. The mastic (FM18) below this beige floor tile (FT18) contains asbestos. The floor tile does not contain asbestos.*



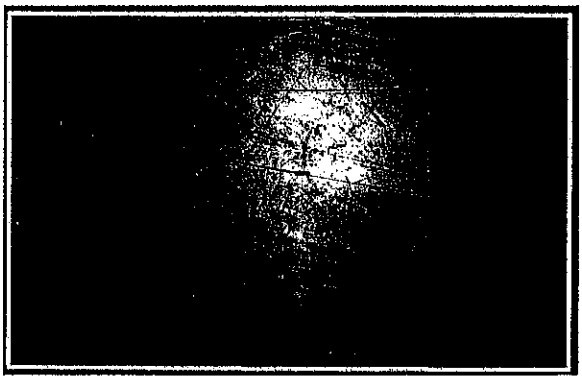
*Photograph 17. FM19. The mastic (FM19) below this floor tile (FT19) contains asbestos. The floor tile does not contain asbestos.*



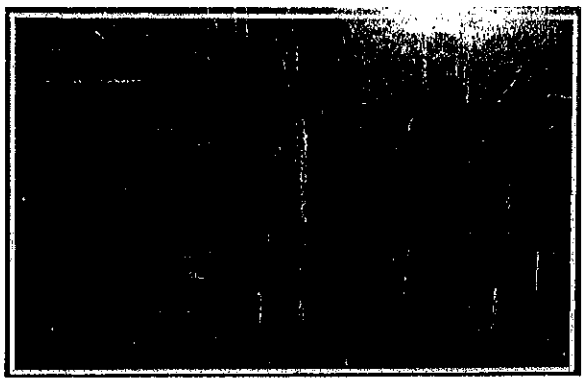
*Photograph 18. FT21 and FM21. This floor tile (FT21) and the mastic below it (FM21) contain asbestos.*



*Photograph 19. FM22. The mastic (FM22) below this floor tile (FT22) contains asbestos. The floor tile does not contain asbestos.*



*Photograph 20. FM28. The mastic (FM28) below this floor tile (FT28) contains asbestos. The floor tile does not contain asbestos.*



*Photograph 21. FT13. The floor tile (FT13) contains asbestos. The mastic below (FM13) does not contain asbestos.*

**Table 1. Homogeneous Materials Listing. Descriptions of asbestos-containing materials from Baker's survey are taken from Baker's report.**

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| Material Description | | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| CT1 | 2'x 4' ceiling tile | Yes | Most First Floor rooms | B9, B10, B11, B36, B37, B40, | No | |
| DW3 | Sheetrock | No | Throughout First Floor | B140, B141, B142 | No | |
| FM5 | Black/yellow mastic | No | Below FT5 | B7, B33, B65 | Yes | 1,015 s.f |
| FM6 | Yellow/gray mastic | No | Below FT6 | B8, B78, B79 | Yes | 1,167 s.f. |
| FM7 | Black mastic | No | Below FT22 | B85, B86, B87 | No | |
| FM8 | Black mastic | No | Below FT8 | B14, B38, B60 | No | |
| FM9 | Black mastic | No | Below FT9 | B15, B31, B52 | Yes | 3,726 s.f. |
| FM10 | Black mastic | No | Below FT10 | B16, B111, B112 | Yes | 257 s.f. |
| FM11 | Black/yellow mastic | No | Below FT11 | B17, B39, B80 | Yes | 1,508 s.f. |
| FM12 | Black mastic | No | Below FT12 | B18, B57, B58 | Yes | 1,077 s.f. |
| FM13 | Yellow mastic | No | Below FT13 | B19, B113, B114 | No | |
| FM14 | Black/yellow mastic | No | Below FT14 | B20, B32, B81 | Yes | 3,648 s.f. |
| FM15 | Black mastic | No | Below FT15 | B21, B115, B116 | Yes | 150 s.f |
| FM16 | Black mastic | No | Below FT16 | B22, B117, B118 | Yes | 532 s.f. |
| FM17 | Black mastic | No | Below FT17 | B23, B107, B108 | Yes | 535 s.f. |
| FM22 | Black mastic | No | Below FT22 | B34, B53, B54 | Yes | 1,988 s.f. |
| FM23 | Gray/white mastic | No | Below FT23 | B35, B119, B120 | No | |
| FM25 | Yellow/gray mastic | No | Below FT25 | B64, B66, B67 | No | |
| FM28 | Black mastic | No | Below FT28 | B82, B83, B84 | Yes | 337 s.f. |
| FM30 | Yellow/gray mastic | No | Below FT30 | B125, B126, B127 | No | |
| FT5 | 12" x 12" white floor tile with brown streaks | No | Rooms 119, 149, 150, 162 | B7, B33, B65 | No | |
| FT6 | 12" x 12" cream floor tile with light brown streaks | No | Rooms 114, 124, 150, 156 | B8, B78, B79 | No | |
| FT7 | 12" x 12" tan floor tile with dark specks | No | Rooms 151, 153, 154, 158, 161 | B13, B109, B110 | No | |
| FT8 | 12" x 12" white floor tile with gray specks | No | Rooms 111, 146-148, 152-154, 175, 179 | B14, B38, B60 | No | |
| FT9 | 12"x 12" blue floor tile with white specks | No | Rooms 103, 105-114, 145, 155, 160, 164, 168, 171, 177-178, 180 | B15, B31, B52 | No | |
| FT10 | 12"x12" gray and salmon floor tile | No | Room 142 | B16, B111, B112 | No | |
| FT11 | 12" x 12" tan floor tile with light brown streaks | No | Rooms 111, 124, 142 | B17, B39, B80 | No | |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| Material Description | | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| FT12 | 12″ x 12″ white floor tile with black streaks | No | Rooms 142, 169, 170, 172-174 | B18, B57, B58 | No | |
| FT13 | 12″ x 12″ green floor tile with white streaks | No | Rooms 144, 145 | B19*, B113, B114 | Yes | 254 s.f. |
| FT14 | 12″ x 12″ cream floor tile with brown and white specks | No | Rooms 105-107, 109, 110, 115, 119, 122, 125-127, 137, 143, 151, 161 | B20, B32, B81 | No | |
| FT15 | 12″ x 12″ gray floor tile with brown and white specks | No | Room 155 | B21, B115, B116 | No | |
| FT16 | 12″ x 12″ cream floor tile with gray and brown specks | No | Room 159 | B22, B117, B118 | No | |
| FT17 | 12″ x 12″ gray floor tile with green and gray specks | No | Room 159 | B23, B107, B108 | No | |
| FT22 | 12″ x 12″ white floor tile with brown streaks | No | Rooms 115, 164-167, 175, 179 | B34, B53, B54 | No | |
| FT23 | 12″ x 12″ beige floor tile with brown streaks | No | Room 103 | B35, B119, B120 | No | |
| FT25 | 12″ x 12″ brown floor tile with brown and white specks | No | Room 128, 162 | B64, B66, B67 | No | |
| FT28 | 12″ x 12″ light olive floor tile | No | Room 140 | B82, B83, B84 | No | |
| FT29 | 9″ x 9″ green floor tile with white streaks | No | Room 138 | B85, B86, B87 | No | |
| FT30 | 12″ x 12″ tan floor tile with brown and white streaks | No | Room 124 | B125, B126, B127 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M025 | 12 x 12 floor tile Olive | No | Rooms 166, 167 | See Baker's report | Yes | 642 s.f. |
| M026 | Flooring adhesive Black | No | Below M025 | See Baker's report | Yes | 642 s.f. |
| M027 | 12 x 12 floor tile White with black | No | Rooms 169-170, 172-174 | See Baker's report | Yes | 920 s.f. |
| M028 | Flooring adhesive Black | No | Below M028 | See Baker's report | Yes | 920 s.f |
| M033 | 12 x 12 floor tile Cream | No | Room 156 | See Baker's report | Yes | 1,008 s.f. |
| M034 | Flooring adhesive Black | No | Rooms 129-130, 133, 134, 139, 156 | See Baker's report | Yes | 1,008 s.f. |
| M035 | 12 x 12 floor tile White with brown | No | Rooms 124, 175 | See Baker's report | Yes | 1,250 s.f. |
| M036 | Flooring adhesive Black | No | Below M035 | See Baker's report | Yes | 1,250 s.f |
| M040 | Flooring adhesive Black | No | Room 135 | See Baker's report | Yes | 640 s.f. |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| M041 | 12 x 12 floor tile Beige | No | Room 119 | See Baker's report | Yes | 267 s.f. |
| M042 | Flooring adhesive Black | No | Below M041 | See Baker's report | Yes | 267 s.f |
| Second Floor | | | | | | |
| CT2 | 2' x 4' ceiling tile | Yes | Rooms 247, 260, 277, 281 | B28, B29 | No | |
| DW2 | Sheetrock | Yes | Throughout Second Floor | B134, B135, B136 | No | |
| FM18 | Black/yellow mastic | No | Below FT18 | B24, B43, B45 | Yes | 2,322s.f. |
| FM19 | Black mastic | No | Below FT19 | B25, B89, B90 | Yes | 117 s.f. |
| FM20 | Yellow mastic | No | Below FT20 | B26, B44, B68 | No | |
| FM21 | Black mastic | No | Below FT21 | B27, B153, B154 | Yes | 953 s.f. |
| FM24 | Black/yellow mastic | No | Below FT24 | B42, B93, B94 | Yes | 1,100 s.f. |
| FM26 | Black mastic | No | Below FT26 | B69, B70, B71 | No | |
| FT18 | 12" x 12" beige floor tile with white and brown specks | No | Hallways 205-207, 282, 283, rooms 200, 208, 220, 226, 243-245, 284-287 | B24, B43, B45 | No | |
| FT19 | 12" x 12" olive floor tile | No | Rooms 224, 286, 287 | B25, B89, B90 | No | |
| FT20 | 12" x 12" white floor tile with gray specks | No | Rooms 203, 209-212, 214-216, 219, 247, 249, 252, 260, 262-263, 273, 274, 276 | B26, B44, B68 | No | |
| FT21 | 12" x 12" tan floor tile with brown specks | No | Rooms 247, 249, 252, 260 | B27, B153, B154 | Yes | 953 sf |
| FT24 | 12"x12" blue floor tile with white specks | No | Hallways 205-207, 288, 289, rooms 200, 208 | B42, B93, B94 | No | |
| FT26 | 12" x 12" white floor tile with brown streaks | No | Room 264-266, 288-289 | B69, B70, B71 | No | |
| SK1 | Sink undercoating | No | Rooms 221, 256, 261 | B30, B76, B88 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M001 | 12 x 12 floor tile Olive | No | Rooms 224, 262, 265, 277, 281; hallways 264-266 | See Baker's report | Yes | 1,591 s.f. |
| M002 | Flooring adhesive Black | No | Below M001 | See Baker's report | Yes | 1,591 s.f. |
| M005 | 12 x 12 floor tile Beige | No | Rooms 209-214, 216, 220, 262, 276 | See Baker's report | Yes | 2,345 s.f. |
| M006 | Flooring adhesive Black | No | Below M005 | See Baker's report | Yes | 2,345 s.f. |
| M007 | 12 x 12 floor tile Cream | No | Rooms 203, 215, 219, 263, 274 | See Baker's report | Yes | 1,500 s.f. |
| M008 | Flooring adhesive Black | No | Below M007 | See Baker's report | Yes | 1,500 s.f. |
| M010 | Flooring adhesive Black | No | Room 277 | See Baker's report | Yes | 262 s.f. |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| M011 | 12 x 12 floor tile White with gray | No | Room 273 | See Baker's report | Yes | 198 s.f. |
| M013 | 12 x 12 floor tile White with brown | No | Room 205 | See Baker's report | Yes | 91 s.f. |
| M014 | Flooring adhesive Black | No | Below M013 | See Baker's report | Yes | 91 s.f. |
| M023 | 12 x 12 floor tile dark Beige | No | Room 277 | See Baker's report | Yes | 262 s.f. |
| M024 | Flooring adhesive Black | No | Below M023 | See Baker's report | Yes | 262 s.f. |
| Third Floor | | | | | | |
| DW1 | Sheetrock | Yes | Throughout Third Floor | B128, B129, B130 | No | |
| FM1 | Black mastic | No | Below FT1 | B1, B149, B150 | Yes | 470 s.f. |
| FM2 | Black mastic | No | Below FT2 | B2, B151, B152 | Yes | 3,425 s.f. |
| FM3 | Yellow mastic | No | Below FT3 | B4, B121, B122 | No | |
| FM4 | Yellow mastic | No | Below FT4 | B5, B48, B106 | No | |
| FM27 | Yellow mastic | No | Below FT27 | B47, B104, B105 | No | |
| FM30 | Yellow mastic | No | Below FT30 | B99, B100, B101 | No | |
| FT1 | 12" x 12" white floor tile with gray streaks | No | Rooms 370, 377 | B1, B149, B150 | No | |
| FT2 | 12" x 12" brown floor tile with black and white specks | No | Hallways 364-366, 388, 389, rooms 363, 367- 377 | B2, B151, B152 | No | |
| FT3 | 12" x 12" white floor tile with gray specks | No | Hallways 305-307, 382, 383, rooms 300, 303, 309-312, 317, 319-320, 372 | B4, B121, B122 | No | |
| FT4 | 12" x 12" white floor tile with brown streaks | No | Rooms 308, 365 | B5, B48, B106 | No | |
| FT27 | 12"x12" blue floor tile with white specks | No | Rooms 308, 313-315 | B47, B104, B105 | No | |
| FT30 | 12" x 12" tan floor tile with white and brown specks | No | Rooms 326, 327, 343-345, 284-387 | B99, B100, B101 | No | |
| SK2 | Sink undercoating | No | Rooms 318, 356, 361 | B51, B95, B96 | No | |
| VJ1 | Air conditioning vibration dampener | No | Room 372, hallway to Room 343 | B3, B123, B124 | No | |
| ACBMs From Baker's Survey Located by SaLUT | | | | | | |
| M052 | 12 x 12 floor tile Olive | No | Hallways 305-307, 364-366, 388, 389 | See Baker's report | Yes | 697 s.f. |
| M053 | Flooring adhesive Black | No | Below M052 | See Baker's report | Yes | 697 s.f. |
| M058 | 12 x 12 floor tile Light beige | No | Rooms 363, 367-377 | See Baker's report | Yes | 2,728 s.f. |
| M059 | Flooring adhesive Black | No | Below M058 | See Baker's report | Yes | 2,728 s.f. |

| Miscellaneous Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| M074 | 12 x 12 floor tile Cream | No | Rooms 300, 303, 308, 311, 313, 315, 319 | See Baker's report | Yes | 1,875 s.f. |
| M075 | Flooring adhesive Black | No | Below M074 | See Baker's report | Yes | 1,875 s.f. |
| M076 | 12 x 12 floor tile Beige | No | Rooms 309, 310, 312, 314, 317, 320 | See Baker's report | Yes | 1,275 s.f. |
| M077 | Flooring adhesive Black | No | Below M076 | See Baker's report | Yes | 1,275 s.f. |

| Surfacing Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| PL1 | Ceiling Plaster | No | Rooms 105, 161, 164 | B12, B41, B63 | No | |
| PL6 | Exterior plaster coating from building structure | No | Exterior | B143, B144, B145 | No | |
| PL7 | Wall plaster | No | Hallways 105, 147, 167 | B146, B147, B148 | No | |
| Second Floor | | | | | | |
| PL2 | Ceiling plaster | No | Room 266, hallways to rooms 226, 228 | B77, B91, B92 | No | |
| PL5 | Exterior plaster coating from building structure | No | Exterior balconies | B137, B138, B139 | No | |
| Third Floor | | | | | | |
| PL3 | Ceiling plaster | No | Room 344, hallways to Rooms 306, 326 | B97, B98, B102 | No | |
| PL4 | Exterior plaster coating from building structure | No | Exterior balconies | B131, B132, B133 | No | |

| Thermal System Insulation Materials | | | | | | |
|---|---|---|---|---|---|---|
| | Material Description | Friable? (Yes/No) | Location | Sample Numbers | ACBM? | Est. Quantity |
| First Floor | | | | | | |
| PW1 | Pipe wrap | No | Rooms 164,180 | B61, B62, B103 | No | |
| Remainder of Building | | | | | | |
| None | | | | | | |

(*) Denotes a material confirmed as ACBM by QC sample analysis.

# FIGURE 1

# BUILDING DRAWING LEGEND

| ASBESTOS CONTAINING MATERIALS AND QUANTITIES | |
|---|---|
| FT/ FM | Floor Tile and/or Mastic |
| **ACCESSIBILITY** | |
| NAC | NO ACCESS ABOVE CEILING |
| NA | NO ACCESS TO THIS SPACE |
| LCA | LIMITED ACCESS BENEATH CARPET |
| **SYMBOLS** | |
| 100 | SPACE NUMBER |
| B25 | POSITIVE BULK SAMPLE LOCATION |
| B35 | NEGATIVE BULK SAMPLE LOCATION |
| B45 | NOT ANALYZED BULK SAMPLE LOCATION |

FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 356
FIRST FLOOR

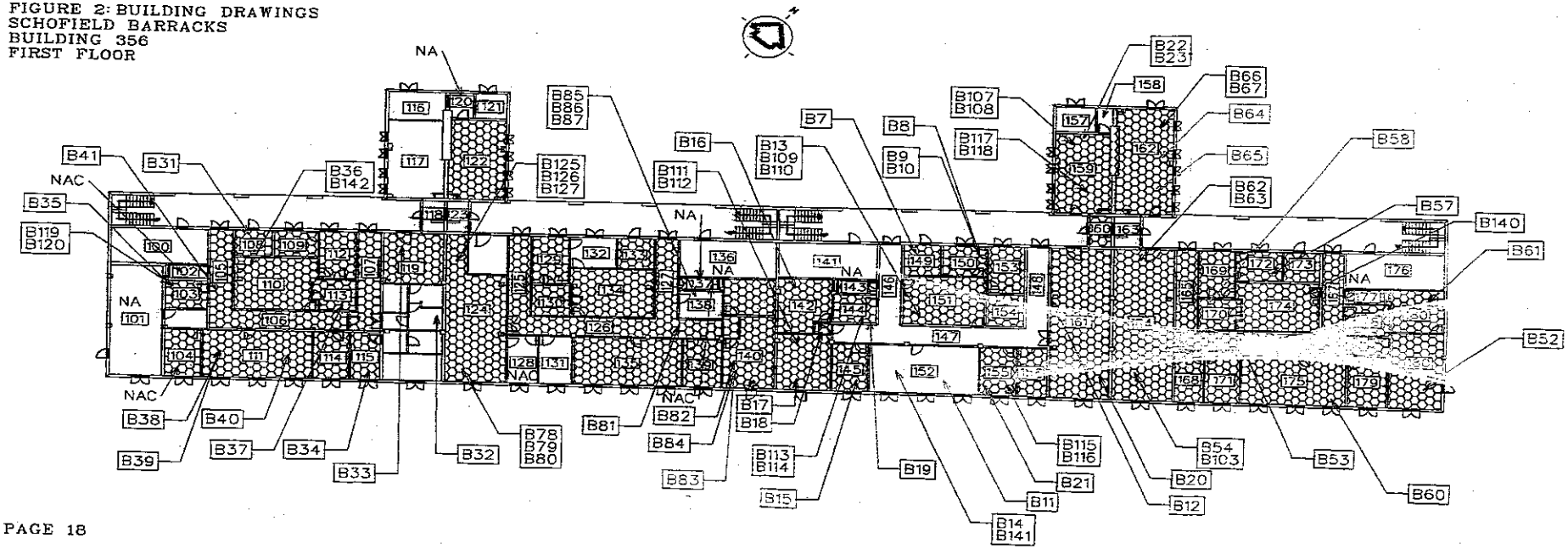


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 356
SECOND FLOOR

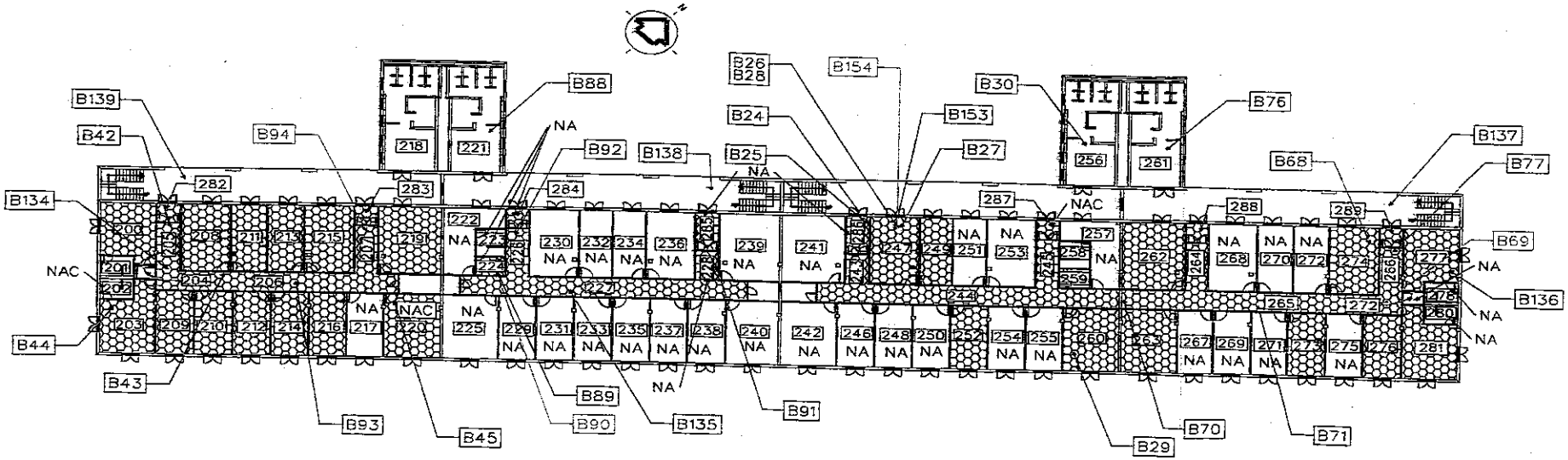
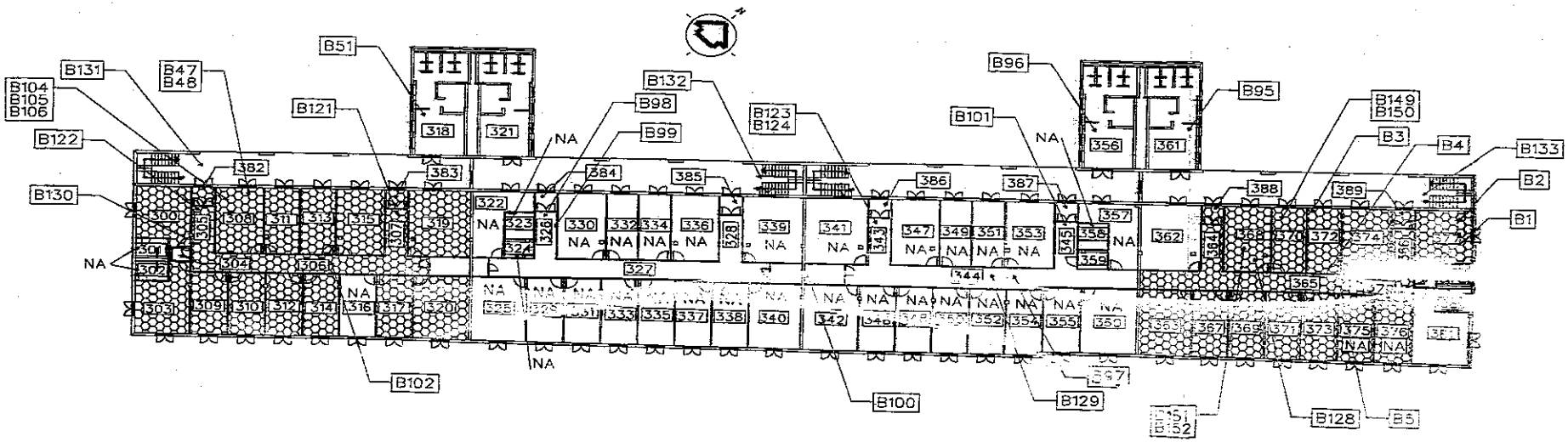


FIGURE 2: BUILDING DRAWINGS
SCHOFIELD BARRACKS
BUILDING 356
THIRD FLOOR



# 4 Recommendations

Each friable ACBM was assessed and placed in the appropriate AHERA category as specified in 40 CFR, Part 763.88. In addition to the seven AHERA assessment categories, SaLUT added an eighth category for all non-friable ACBM.

SaLUT also categorized the condition of each ACBM at the time of the survey, as follows:

**Good** No damage observed

**Fair** The area of distributed damage was less than 10 percent and greater than 2 percent. The area of localized damage was less than 25 percent and greater than 2 percent.

**Poor** The area of distributed damage was greater than 10 percent and the localized damage was greater than 25 percent.

Based on the AHERA assessment category and SaLUT's condition assessment, SaLUT recommends on or more of the following response actions for each ACBM:

**O&M** Maintain the ACBM. Perform operations and maintenance procedures in a manner that does not damage the material. These procedures are specified in 29 CFR 1926.1101 and HAR 11-502-10. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

**Repair** Damaged areas should be repaired. Repair of damaged material must be performed in accordance with 29 CFR 1926.1101 and as specified in the management plan for the installation unless otherwise authorized, all repairs should be handled by State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101.

Undamaged and repaired materials are subject to the O&M response action.

**Remove** The material should be removed. Removal must be performed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

If the building is demolished or renovation will impact any ACBMs, those materials must be removed by a State of Hawai'i-licensed contractor in accordance with 29 CFR 1926.1101. Removal must follow the most stringent guidelines provided by either the State of Hawai'i or Federal regulations.

Table 2 provides the AHERA assessment category, SaLUT's condition assessment, and SaLUT's recommended response action for each ACBM.

**Table 2. Summary of Asbestos-Containing Materials.**

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| First Floor | | | | | | | |
| FM5 Black/yellow mastic | Below FT5 (rooms 119, 149, 150, 162) | 1, 015 sf | No | Good | 8 | O&M | 6 |
| FM6 Yellow/gray mastic | Below FT6 (rooms 114, 124, 150, 156) | 1,167 sf | No | Good | 8 | O&M | 7 |
| FM9 Black mastic | Below FT9 (rooms 103, 105-114, 145, 155, 160, 164, 168, 171, 177-178, 180) | 3,726 sf | No | Good | 8 | O&M | 8 |
| FM10 Black mastic | Below FT10 (room 142) | 257 sf | No | Good | 8 | O&M | 9 |
| FM11 Black/yellow mastic | Below FT11 (rooms 111, 124, 142) | 1,508 sf | No | Good | 8 | O&M | 10 |
| FM12 Black mastic | Below FT12 (rooms 142, 169, 170, 172-174) | 1,077 sf | No | Good | 8 | O&M | 11 |
| FM14 Black/yellow mastic | Below FT14 (rooms 105-107, 109, 110, 115, 119, 122, 125-127, 137, 143, 151, 161) | 3,648 sf | No | Good | 8 | O&M | 12 |
| FM15 Black mastic | Below FT15 (room 155) | 150 sf | No | Good | 8 | O&M | 13 |
| FM16 Black mastic | Below FT16 (room 159) | 532 sf | No | Good | 8 | O&M | 14 |
| FM17 Black mastic | Below FT17 (room 159) | 535 sf | No | Good | 8 | O&M | 15 |
| FM22 Black mastic | Below FT22 (rooms 115, 164-167, 175, 179) | 1,988 sf | No | Good | 8 | O&M | 19 |
| FM28 Black mastic | Below FT28 (room 140) | 337 sf | No | Good | 8 | O&M | 20 |
| FT13 12" x 12" green floor tile with white streaks | Rooms 144, 145 | 254 sf | No | Good | 8 | O&M | 21 |
| M025 12 x 12 floor tile Olive | Rooms 166, 167 | 642 sf | No | Good | 8 | O&M | None |
| M026 Flooring adhesive Black | Below M025 | 642 sf | No | Good | 8 | O&M | None |
| M027 12 x 12 floor tile White with black | Rooms 169-170, 172-174 | 920 sf | No | Good | 8 | O&M | None |
| M028 Flooring adhesive Black | Below M028 | 920 sf | No | Good | 8 | O&M | None |
| M033 12 x 12 floor tile Cream | Room 156 | 1,008 sf | No | Good | 8 | O&M | None |

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| M034 Flooring adhesive Black | Rooms 129-130, 133, 134, 139, 156 | 1,008 sf | No | Good | 8 | O&M | None |
| M035 12 x 12 floor tile White with brown | Rooms 124, 175 | 1,250 sf | No | Good | 8 | O&M | None |
| M036 Flooring adhesive Black | Below M035 | 1,250 sf | No | Good | 8 | O&M | None |
| M040 Flooring adhesive Black | Room 135 | 640 sf | No | Good | 8 | O&M | None |
| M041 12 x 12 floor tile Beige | Room 119 | 267 sf | No | Good | 8 | O&M | None |
| M042 Flooring adhesive Black | Below M041 | 267 sf | No | Good | 8 | O&M | None |
| Second Floor | | | | | | | |
| FM18 Black/yellow mastic | Below FT18 (hallways 205-207, 282, 283, rooms 200, 208, 220, 226, 243-245, 284-287) | 2,322 sf | No | Good | 8 | O&M | 16 |
| FM19 Black mastic | Below FT19 (rooms 224, 286, 287) | 117 sf | No | Good | 8 | O&M | 17 |
| FM21 Black mastic | Below FT21 (rooms 247, 249, 252, 260) | 953 sf | No | Good | 8 | O&M | 18 |
| FM24 Black/yellow mastic | Below FT24 (hallways 205-207, 288, 289, rooms 200, 208) | 1,100 sf | No | Good | 8 | O&M | 8 |
| FT21 12" x 12" tan floor tile with brown specks | Rooms 247, 249, 252, 260 | 953 sf | No | Good | 8 | O&M | 18 |
| M001 12 x 12 floor tile Olive | Rooms 224, 262, 265, 277, 281; hallways 264-266 | 1,591 sf | No | Good | 8 | O&M | None |
| M002 Flooring adhesive Black | Below M001 | 1,591 sf | No | Good | 8 | O&M | None |
| M005 12 x 12 floor tile Beige | Rooms 209-214, 216, 220, 262, 276 | 2,345 sf | No | Good | 8 | O&M | None |
| M006 Flooring adhesive Black | Below M005 | 2,345 sf | No | Good | 8 | O&M | None |
| M007 12 x 12 floor tile Cream | Rooms 203, 215, 219, 263, 274 | 1,500 sf | No | Good | 8 | O&M | None |
| M008 Flooring adhesive Black | Below M007 | 1,500 sf | No | Good | 8 | O&M | None |
| M010 Flooring adhesive Black | Room 277 | 262 sf | No | Good | 8 | O&M | None |
| M011 12 x 12 floor tile White with gray | Room 273 | 198 sf | No | Good | 8 | O&M | None |
| M013 12 x 12 floor tile White with brown | Room 205 | 91 sf | No | Good | 8 | O&M | None |

| Material Description | Location | Quantity | Friable | Cond. Assess. | AHERA Assess. Cat. | Recommended Response Action | Photo Ref. |
|---|---|---|---|---|---|---|---|
| M014 Flooring adhesive Black | Below M013 | 91 sf | No | Good | 8 | O&M | None |
| M023 12 x 12 floor tile dark Beige | Room 277 | 262 sf | No | Good | 8 | O&M | None |
| M024 Flooring adhesive Black | Below M023 | 262 sf | No | Good | 8 | O&M | None |
| Third Floor | | | | | | | |
| FM1 Black mastic | Below FT1 (rooms 370, 377) | 470 sf | No | Good | 8 | O&M | 4 |
| FM2 Black mastic | Below FT2 (hallways 364-366, 388, 389, rooms 363, 367- 377) | 3,425 sf | No | Good | 8 | O&M | 5 |
| M052 12 x 12 floor tile Olive | Hallways 305-307, 364-366, 388, 389 | 697 sf | No | Good | 8 | O&M | None |
| M053 Flooring adhesive Black | Below M052 | 697 sf | No | Good | 8 | O&M | None |
| M058 12 x 12 floor tile Light beige | Rooms 363, 367-377 | 2,728 sf | No | Good | 8 | O&M | None |
| M059 Flooring adhesive Black | Below M058 | 2,728 sf | No | Good | 8 | O&M | None |
| M074 12 x 12 floor tile Cream | Rooms 300, 303, 308, 311, 313, 315, 319 | 1,875 sf | No | Good | 8 | O&M | None |
| M075 Flooring adhesive Black | Below M074 | 1,875 sf | No | Good | 8 | O&M | None |
| M076 12 x 12 floor tile Beige | Rooms 309, 310, 312, 314, 317, 320 | 1,275 sf | No | Good | 8 | O&M | None |
| M077 Flooring adhesive Black | Below M076 | 1,275 sf | No | Good | 8 | O&M | None |

Table 3 provides SaLUT's cost estimate for abating (i.e., removing) each ACBM identified in the building. These estimates are conceptual cost estimates based on standard unit rates for different types of ACBM except for very small abatement projects, where the minimum cost is $1,200. Contractor mobilization/demobilization, transportation, disposal, and other miscellaneous costs are included in the unit. Operations and maintenance (O&M) costs are not provided as part of the recommended response cost.

**Table 3. Asbestos Abatement Cost Estimates.**

| Material Type | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|
| First Floor | | | | |
| FM5 Black/yellow mastic | Below FT5 (rooms 119, 149, 150, 162) | 1, 015 sf | 3 | $3,045 |
| FM6 Yellow/gray mastic | Below FT6 (rooms 114, 124, 150, 156) | 1,167 sf | 3 | 3,501 |
| FM9 Black mastic | Below FT9 (rooms 103, 105-114, 145, 155, 160, 164, 168, 171, 177-178, 180) | 3,726 sf | 3 | 11,178 |
| FM10 Black mastic | Below FT10 (room 142) | 257 sf | 3 | 771 |

| Material Type | | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|---|
| FM11 | Black/yellow mastic | Below FT11 (rooms 111, 124, 142) | 1,508 sf | 3 | 4,524 |
| FM12 | Black mastic | Below FT12 (rooms 142, 169, 170, 172-174) | 1,077 sf | 3 | 3,231 |
| FM14 | Black/yellow mastic | Below FT14 (rooms 105-107, 109, 110, 115, 119, 122, 125-127, 137, 143, 151, 161) | 3,648 sf | 3 | 10,944 |
| FM15 | Black mastic | Below FT15 (room 155) | 150 sf | 3 | 450 |
| FM16 | Black mastic | Below FT16 (room 159) | 532 sf | 3 | 1,596 |
| FM17 | Black mastic | Below FT17 (room 159) | 535 sf | 3 | 1,605 |
| FM22 | Black mastic | Below FT22 (rooms 115, 164-167, 175, 179) | 1,988 sf | 3 | 5,964 |
| FM28 | Black mastic | Below FT28 (room 140) | 337 sf | 3 | 1,011 |
| FT13 | 12" x 12" green floor tile with white streaks | Rooms 144, 145 | 254 sf | 5 | 1,270 |
| M025 | 12 x 12 floor tile Olive | Rooms 166, 167 | 642 sf | 5 | 3,210 |
| M026 | Flooring adhesive Black | Below M025 | 642 sf | 3 | 1,926 |
| M027 | 12 x 12 floor tile White with black | Rooms 169-170, 172-174 | 920 sf | 5 | 4,600 |
| M028 | Flooring adhesive Black | Below M028 | 920 sf | 3 | 2,760 |
| M033 | 12 x 12 floor tile Cream | Room 156 | 1,008 sf | 5 | 5,040 |
| M034 | Flooring adhesive Black | Rooms 129-130, 133, 134, 139, 156 | 1,008 sf | 3 | 3,024 |
| M035 | 12 x 12 floor tile White with brown | Rooms 124, 175 | 1,250 sf | 5 | 6,250 |
| M036 | Flooring adhesive Black | Below M035 | 1,250 sf | 3 | 3,750 |
| M040 | Flooring adhesive Black | Room 135 | 640 sf | 3 | 1,920 |
| M041 | 12 x 12 floor tile Beige | Room 119 | 267 sf | 5 | 1,335 |
| M042 | Flooring adhesive Black | Below M041 | 267 sf | 3 | 801 |
| | | Second Floor | | | |
| FM18 | Black/yellow mastic | Below FT18 (hallways 205-207, 282, 283, rooms 200, 208, 220, 226, 243-245, 284-287) | 2,322 sf | 3 | 6,966 |
| FM19 | Black mastic | Below FT19 (rooms 224, 286, 287) | 117 sf | 3 | 351 |
| FM21 | Black mastic | Below FT21 (rooms 247, 249, 252, 260) | 953 sf | 3 | 2,859 |
| FM24 | Black/yellow mastic | Below FT24 (hallways 205-207, 288, 289, rooms 200, 208) | 1,100 sf | 3 | 3,300 |
| FT21 | 12" x 12" tan floor tile with brown specks | Rooms 247, 249, 252, 260 | 953 sf | 5 | 4,765 |
| M001 | 12 x 12 floor tile Olive | Rooms 224, 262, 265, 277, 281; hallways 264-266 | 1,591 sf | 5 | 7,955 |
| M002 | Flooring adhesive Black | Below M001 | 1,591 sf | 3 | 4,773 |
| M005 | 12 x 12 floor tile Beige | Rooms 209-214, 216, 220, 262, 276 | 2,345 sf | 5 | 11,725 |

| Material Type | | Location | Quantity | Unit Cost ($) | Total Removal Cost |
|---|---|---|---|---|---|
| M006 | Flooring adhesive Black | Below M005 | 2,345 sf | 3 | 7,035 |
| M007 | 12 x 12 floor tile Cream | Rooms 203, 215, 219, 263, 274 | 1,500 sf | 5 | 7,500 |
| M008 | Flooring adhesive Black | Below M007 | 1,500 sf | 3 | 4,500 |
| M010 | Flooring adhesive Black | Room 277 | 262 sf | 3 | 786 |
| M011 | 12 x 12 floor tile White with gray | Room 273 | 198 sf | 5 | 990 |
| M013 | 12 x 12 floor tile White with brown | Room 205 | 91 sf | 5 | 455 |
| M014 | Flooring adhesive Black | Below M013 | 91 sf | 3 | 273 |
| M023 | 12 x 12 floor tile dark Beige | Room 277 | 262 sf | 5 | 1,310 |
| M024 | Flooring adhesive Black | Below M023 | 262 sf | 3 | 786 |
| | | Third Floor | | | |
| FM1 | Black mastic | Below FT1 (rooms 370, 377) | 470 sf | 3 | 1,410 |
| FM2 | Black mastic | Below FT2 (hallways 364-366, 388, 389, rooms 363, 367- 377) | 3,425 sf | 3 | 10,275 |
| M052 | 12 x 12 floor tile Olive | Hallways 305-307, 364-366, 388, 389 | 697 sf | 5 | 3,485 |
| M053 | Flooring adhesive Black | Below M052 | 697 sf | 3 | 2,091 |
| M058 | 12 x 12 floor tile Light beige | Rooms 363, 367-377 | 2,728 sf | 5 | 13,640 |
| M059 | Flooring adhesive Black | Below M058 | 2,728 sf | 3 | 8,184 |
| M074 | 12 x 12 floor tile Cream | Rooms 300, 303, 308, 311, 313, 315, 319 | 1,875 sf | 5 | 9,375 |
| M075 | Flooring adhesive Black | Below M074 | 1,875 sf | 3 | 5,625 |
| M076 | 12 x 12 floor tile Beige | Rooms 309, 310, 312, 314, 317, 320 | 1,275 sf | 5 | 6,375 |
| M077 | Flooring adhesive Black | Below M076 | 1,275 sf | 3 | 3,825 |
| Total abatement cost | | | | | $214,320 |

**Analytical Laboratory Sample Results**
**And**
**Chains of Custody**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10329
**Report Date:** 12/9/01

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 6 **# Layers:** 8

**Collected Date:** 12/3/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** G. Slaugenhou
**Analysis Date:** 12/9/01
**Received By:** Santos, K.
**Received Date:** 12/5/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B1 | HB01-3411-A | Room 377 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *100%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B1 | HB01-3411-B | Room 377 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |
| Wollastonite | *Trace* |

*% Asbestos:* *2%*

*% Other Fibrous Materials:* *3%*

*% Non Fibrous Materials:* *95%*

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10329
Report Date: 12/9/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B2 | HB01-3412-A | Room 377 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fibrous Materials**

None Detected

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B2 | HB01-3412-B | Room 377 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 20% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos: 20%*

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 77%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B3 | HB01-3413 | Room 372 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Fabric | Black/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Synthetic | 80% |

*% Asbestos: 0%*

*% Other Fibrous Materials: 80%*

*% Non Fibrous Materials: 20%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10329
**Report Date:** 12/9/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B4 | HB01-3414 | Room 372 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic recovered.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B5 | HB01-3415 | Room 365 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | VC Tile | Tan |

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic recovered.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 356-B6 | HB01-3416 | Room 338 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic, CB | Tan/White |

***% Asbestos: 0%***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10329
Report Date: 12/9/01

Comments:

Analyst _____ Date 12-10-01
QC _____ Date 12/14/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 35 **# Layers:** 56

**Collected Date:** 12/14/01
**Collected By:** client
**TAT:** 3 Business Days
**Analysis By:** A.Clayton
**Analysis Date:** 12/21/01
**Received By:** S.Santos
**Received Date:** 12/19/01

**Project Name/Location:** Quad C - Schofield Barracks - Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B7 | HB01-3761A | 1st floor room #149 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

***% Non Fibrous Materials:* 99%**

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B7 | HB01-3761B | 1st floor room #149 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 3% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *3%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* 95%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B8 | HB01-3762A | 1st floor room #150 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 98%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B8 | HB01-3762B | 1st floor room #150 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 2%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 93%

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B9 | HB01-3763 | 1st floor room #150 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 32% |
| Cellulose | 25% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 57%

**% Non Fibrous Materials:** 43%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B10 | HB01-3764 | 1st floor room #150 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 33% |
| Cellulose | 30% |

*% Other Fibrous Materials:* *63%*

**% Non Fibrous Materials: 37%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B11 | HB01-3765 | 1st floor room #152 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Tan/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 30% |
| Cellulose | 35% |

*% Other Fibrous Materials:* *65%*

**% Non Fibrous Materials: 35%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B12 | HB01-3766 | 1st floor room #161 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non Friable | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Plaster | Grey |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B13 | HB01-3767 | 1st floor room #151 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Cream |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

*% Non Fibrous Materials:* 98%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B14 | HB01-3768A | 1st floor room #152 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 3%

*% Non Fibrous Materials:* 97%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B14 | HB01-3768B | 1st floor room #152 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 10%

*% Non Fibrous Materials:* 90%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B15 | HB01-3769A | 1st floor room #145 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B15 | HB01-3769B | 1st floor room #145 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *5%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials:* *10%*

**% Non Fibrous Materials: 85%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B16 | HB01-3770A | 1st floor room #142 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B16 | HB01-3770B | 1st floor room #142 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 3% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *3%*

*% Other Fibrous Materials:* *10%*

*% Non Fibrous Materials:* *87%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B17 | HB01-3771A | 1st floor room #142 | 1 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

*% Asbestos:* *Trace*

*% Other Fibrous Materials:* *0%*

*% Non Fibrous Materials:* *100%*

Sample Comments: <1% chrysotile asbestos found in tile

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B17 | HB01-3771B | 1st floor room #142 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | m | Black |

*% Asbestos:* *4%*

*% Other Fibrous Materials:* *10%*

*% Non Fibrous Materials:* *86%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B18 | HB01-3772A | 1st floor room #142 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

*% Asbestos:* 0%

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* 3%

**% Non Fibrous Materials:** 97%

Sample Comments:

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B18 | HB01-3772B | 1st floor room #142 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 5%

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 12% |

*% Other Fibrous Materials:* 12%

**% Non Fibrous Materials:** 83%

Sample Comments:

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B19 | HB01-3773A | 1st floor room #144 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Green |

*% Asbestos:* 0%

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* 3%

**% Non Fibrous Materials:** 97%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B19 | HB01-3773B | 1st floor room #144 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 10%

**% Non Fibrous Materials:** 90%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B20 | HB01-3774A | 1st floor room #161 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan/Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 3%

**% Non Fibrous Materials:** 97%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B20 | HB01-3774B | 1st floor room #161 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Grey |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* Trace

**% Non Fibrous Materials:** 99%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B21 | HB01-3775A | 1st floor room #155 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan/Beige |

**Asbestos**

None Detected

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 7% |

*% Other Fibrous Materials:* *7%*

***% Non Fibrous Materials:* *93%***

**Sample Comments:**

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B21 | HB01-3775B | 1st floor room #155 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 10% |

*% Asbestos:* *10%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:* *88%***

**Sample Comments:**

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B22 | HB01-3776A | 1st floor room #159 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan/Beige |

**Asbestos**

None Detected

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

***% Non Fibrous Materials:* *97%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B22 | HB01-3776B | 1st floor room #159 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 12% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 5%

*% Other Fibrous Materials:* 12%

**% Non Fibrous Materials:** 83%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B23 | HB01-3777A | 1st floor room #159 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 98%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B23 | HB01-3777B | 1st floor room #159 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* 2%

*% Other Fibrous Materials:* 10%

**% Non Fibrous Materials:** 88%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B24 | HB01-3778A | 2nd floor room #286 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B24 | HB01-3778B | 2nd floor room #286 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Adhesive | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 12% |

*% Other Fibrous Materials:* *12%*

**% Non Fibrous Materials: 88%**

Sample Comments:

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121401-356-JMV-B25 | HB01-3779A | 2nd floor room #286 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Lt.Green |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 1214701-356-JMV-B25 | HB01-3779B | 2nd floor room #286 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 2%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 93%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B26 | HB01-3780A | 2nd floor room #247 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials:** 98%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B26 | HB01-3780B | 2nd floor room #247 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 20% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 20%

**% Non Fibrous Materials:** 80%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B27 | HB01-3781A | 2nd floor room #247 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige/Tan |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

***% Non Fibrous Materials:*** ***98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B27 | HB01-3781B | 2nd floor room #147 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 12% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos:* *12%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials:* *10%*

***% Non Fibrous Materials:*** ***78%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B28 | HB01-3782 | 2nd floor room #247 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Grey/White |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 30% |

*% Other Fibrous Materials:* *55%*

***% Non Fibrous Materials:*** ***45%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B29 | HB01-3783 | 2nd floor room #260 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Grey/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 20% |
| Cellulose | 25% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *45%*

**% Non Fibrous Materials: 55%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B30 | HB01-3784 | 2nd floor room #256 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 99%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B31 | HB01-3785A | 1st floor room #108 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Blue |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B31 | HB01-3785B | 1st floor room #108 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Adhesive | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials:* *10%*

**% Non Fibrous Materials: 90%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B32 | HB01-3786A | 1st floor room #119 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials:* *3%*

**% Non Fibrous Materials: 97%**

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B32 | HB01-3786B | 1st floor room #119 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Adhesive | Yellow |

*% Asbestos:* *0%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 15% |

*% Other Fibrous Materials:* *15%*

**% Non Fibrous Materials: 85%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B33 | HB01-3787A | 1st floor room #119 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 4% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *4%*

*% Non Fibrous Materials:* *96%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B33 | HB01-3787B | 1st floor room #119 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Adhesive | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 12% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *12%*

*% Non Fibrous Materials:* *88%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B34 | HB01-3788A | 1st floor room #115 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Asbestos:* *0%*

*% Other Fibrous Materials:* *Trace*

*% Non Fibrous Materials:* *99%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B34 | HB01-3788B | 1st floor room #115 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 7% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

*% Asbestos:* 7%

*% Other Fibrous Materials:* 10%

**% Non Fibrous Materials:** 83%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B35 | HB01-3789 | 1st floor room #103 | 1 of 1 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 95%

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B36 | HB01-3790 | 1st floor room #110 | 1 of 1 |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 10% |
| Cellulose | 25% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Ceiling Tile | Grey/White |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 35%

**% Non Fibrous Materials:** 65%

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B37 | HB01-3791 | 1st floor room #113 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Grey/White |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 25% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 50%

**% Non Fibrous Materials: 50%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B38 | HB01-3792 | 1st floor room #111 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials: 95%**

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B39 | HB01-3793A | 1st floor room #111 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 2%

**% Non Fibrous Materials: 98%**

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H01-1216
Client Project#: 01-290

Report #: 10642
Report Date: 12/24/01

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B39 | HB01-3793B | 1st floor room #111 | 2 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Mastic | Black |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Asbestos:* 5%

*% Other Fibrous Materials:* 10%

**% Non Fibrous Materials:** 85%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B40 | HB01-3794 | 1st floor room #111 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Friable | Yes | No | Ceiling Tile | Grey/White |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 25% |
| Cellulose | 25% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 50%

**% Non Fibrous Materials:** 50%

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121401-356-JMV-B41 | HB01-3795 | 1st floor room #105 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | No | No | Plaster | Grey |

**Asbestos**

None Detected

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos:* 0%

*% Other Fibrous Materials:* 5%

**% Non Fibrous Materials:** 95%

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H01-1216
**Client Project#:** 01-290

**Report #:** 10642
**Report Date:** 12/24/01

Comments:

**Analyst** _____ **Date** 12/21/01
**QC** Shao Wells **Date** 12/24/01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11130
**Report Date:** 1/23/2002

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 3 **# Layers:** 6

**Collected Date:** 12/17/200
**Collected By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/23/2002
**Received By:** R. Hamasaki
**Received Date:** 1/23/2002

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B42 | HB02-303A | 2nd Fl. Rm. 205 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/white |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B42 | HB02-303B | 2nd Fl. Rm.205 | 2 of 2 |

**Asbestos**

| *Type* | *%* |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | black/yellow |

*% Asbestos: 4%*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials: 10%*

***% Non Fibrous Materials: 86%***

**Sample Comments:** Client requested Pos. stop for FT-24

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11130
Report Date: 1/23/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B47 | HB02-304A | 3rd Fl. Rm.308 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/white |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B47 | HB02-304B | 3rd Fl. Rm.308 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos: None*

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 97%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B48 | HB02-305A | 3rd Fl. Rm.308 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11130
Report Date: 1/23/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B48 | HB02-305B | 3rd Fl. Rm.308 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 97%*

**Sample Comments:**

Comments:

Analyst [signature] Date 1/23/02

QC [signature] Date 1/23/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10879
**Report Date:** 1/9/02

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 2 **# Layers:** 4

**Collected Date:** 12/17/01
**Collected By:** Client
**TAT:** 3 Business Days
**Analysis By:** S. Wells
**Analysis Date:** 1/8/02
**Received By:** Santos, K.
**Received Date:** 1/7/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B43 | HB02-0026-A | Room 206 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Cream |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 121701-356-JMV-B43 | HB02-0026-B | Room 206 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Asbestos: 2%*

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 93%***

**Sample Comments:** Black mastic mixed with yellow.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10879
Report Date: 1/9/02

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121701-356-JMV-B45 | HB02-0027-A | Room 220 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Cream |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 121701-356-JMV-B45 | HB02-0027-B | Room 220 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

*% Asbestos: 4%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

***% Non Fibrous Materials: 91%***

**Sample Comments:**

Comments:

**Analyst** [signature] **Date** 1/9/02

**QC** [signature] **Date** 1/9/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10954
**Report Date:** 1/14/02

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 1 **# Layers:** 1

**Collected Date:** 12/28/01
**Collected By:** Client
**TAT:** One week (or more
**Analysis By:** S. Wells
**Analysis Date:** 1/14/02
**Received By:** R.Hamasaki
**Received Date:** 1/10/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B51 | HB02-0073 | Room 318 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Asbestos: None*

*% Other Fibrous Materials: 4%*

*% Non Fibrous Materials: 96%*

**Sample Comments:**

Comments:

**Analyst** S. Wells **Date** 1/14/02

**QC** [illegible] **Date** 1-14-02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 15 # Layers: 25

Collected Date: 12/28/200
Collected By: Client
TAT: 3 Business Days
Analysis By: S. Wells
Analysis Date: 1/9/2002
Received By: Santos, K.
Received Date: 1/7/2002

Project Name/Location: Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B44 | HB02-0028-A | Room 203 | 1 of 2 |

Asbestos

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

Other Fibrous Materials

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments: COC has sample collected on 12/28/01, sample container is labeled 12-17-01

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B44 | HB02-0028-B | Room 203 | 2 of 2 |

Asbestos

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

Other Fibrous Materials

| *Type* | *%* |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 97%*

Sample Comments: COC has sample collected on 12/28/01, sample container is labeled 12/17/01.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B68 | HB02-0029-A | Room 274 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B68 | HB02-0029-B | Room 274 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: None*

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 98%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B53 | HB02-0030-A | Room 166 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B53 | HB02-0030-B | Room 166 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 97%*

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B54 | HB02-0031 | Room 164 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments: No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B57 | HB02-0032-A | Room 172 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B57 | HB02-0032-B | Room 172 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: None*

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 98%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B58 | HB02-0033 | Room 170 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments: No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B64 | HB02-0034 | Room 162 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments: No mastic on tile.

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B66 | HB02-0035-A | Room 162 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B66 | HB02-0035-B | Room 162 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Gray |

*% Asbestos:* *None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials:* *2%*

**% Non Fibrous Materials: 98%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B67 | HB02-0036-A | Room 162 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos:* *None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials:* *Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B67 | HB02-0036-B | Room 162 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Grey |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos: None*

*% Other Fibrous Materials: 3%*

*% Non Fibrous Materials: 97%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B69 | HB02-0037 | Hallway In Front of Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments: No mastic on tile.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B70 | HB02-0038 | Hallway In Front of Room 265 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B71 | HB02-0039-A | Hallway In Front of Room 265 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 100%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B71 | HB02-0039-B | Hallway In Front of Room 265 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

**% Non Fibrous Materials: 97%**

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B52 | HB02-0040-A | Room 180 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials: Trace*

**% Non Fibrous Materials: 99%**

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B52 | HB02-0040-B | Room 180 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B60 | HB02-0041-A | Room 175 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B60 | HB02-0041-B | Room 175 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: None*

*% Other Fibrous Materials: 2%*

*% Non Fibrous Materials: 98%*

Sample Comments:

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10919
Report Date: 1/10/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B65 | HB02-0042 | Room 162 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

**Sample Comments:** No mastic on tile.

Comments:

Analyst Shd Wilks Date 1-09-02

QC [illegible] Date 1-11-01

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11128
**Report Date:** 1/23/02

**Client:** Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 2 **# Layers:** 2

**Collected Date:** 12/28/01
**Collected By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/23/02
**Received By:** R.Hamasaki
**Received Date:** 1/23/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B61 | HB02-306 | 1st fl. Rm 180 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | slv./wht./gry. |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 25% |

*% Other Fibrous Materials: 40%*

***% Non Fibrous Materials: 60%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 122801-356-JMV-B62 | HB02-307 | 1st fl. Rm. 164 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | slv./wht./gry. |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 25% |

*% Other Fibrous Materials: 40%*

***% Non Fibrous Materials: 60%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11128
**Report Date:** 1/23/02

Comments:

**Analyst** _____ **Date** 1/23/02
**QC** _____ **Date** 1/23/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10964
**Report Date:** 1/14/02

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 1 **# Layers:** 1

**Collected Date:** 12/28/01
**Collected By:** Client
**TAT:** One week (or more
**Analysis By:** S. Wells
**Analysis Date:** 1/14/02
**Received By:** R.Hamasaki
**Received Date:** 1/10/02

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B63 | HB02-0101 | Not Specified | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fiberous? | Homo-genious | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

Comments:

**Analyst** Stan Wells **Date** 1/14/02
**QC** [illegible] **Date** 1/14/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 27 # Layers: 38

Collected Date: 1/8/02
Collected By: Client
TAT: One week (or more
Analysis By: S. Wells
Analysis Date: 1/14/02
Received By: R. Hamasaki
Received Date: 1/10/02

Project Name/Location: Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B76 | HB02-0074 | Room 261 | 1 of 1 |

Asbestos

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

*% Asbestos: None*

Other Fibrous Materials

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B77 | HB02-0075 | Room 266 | 1 of 1 |

Asbestos

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Green |

*% Asbestos: None*

Other Fibrous Materials

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B78 | HB02-0076-A | Room 124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B78 | HB02-0076-B | Room 124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 99%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B79 | HB02-0077-A | Room 124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B79 | HB02-0077-B | Room 124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Gray |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B80 | HB02-0078-A | Room 124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B80 | HB02-0078-B | Room 124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Gray |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B81 | HB02-0079-A | Room 119 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B81 | HB02-0079-B | Room 119 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 2% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Black |

*% Asbestos: 2%*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials: 10%*

***% Non Fibrous Materials: 88%***

**Sample Comments:** Black mastic mixed with small amount of yellow mastic.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B82 | HB02-0080-A | Room 140 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B82 | HB02-0080-B | Room 140 | 2 of 2 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 4% |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 8% |

*% Asbestos: 4%*

*% Other Fibrous Materials: 8%*

***% Non Fibrous Materials: 88%***

**Sample Comments:** Client requested positive stop for FT-28.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B83 | HB02-0081 | Room 140 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | *Trace* |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: Trace*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** <1% Chrysotile Asbestos detected in floor tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B84 | HB02-0082 | Room 140 | 1 of 1 |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Asbestos**

**None Detected**

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B85 | HB02-0083 | Room 138 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Green |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B86 | HB02-0084 | Room 138 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Green |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:** No mastic on tile.

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B87 | HB02-0085 | Room 138 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Green |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10965
**Report Date:** 1/14/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B88 | HB02-0086 | Room 221 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Asbestos: None*

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B89 | HB02-0087-A | Room 224 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Olive/Brown |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B89 | HB02-0087-B | Room 224 | 2 of 2 |

**Asbestos**

| Type | % |
|---|---|
| Chrysotile | 5% |

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Black |

**Other Fibrous Materials**

None Detected

*% Asbestos: 5%*

*% Other Fibrous Materials: None*

***% Non Fibrous Materials: 95%***

**Sample Comments:** Client requested positive stop for FT-19.

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B90 | HB02-0088 | Not Specified On Chain of Custody | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Olive/Brown |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B91 | HB02-0089 | Room 228 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B92 | HB02-0090 | Room 226 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

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# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10965
**Report Date:** 1/14/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B93 | HB02-0091-A | Room 206 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B93 | HB02-0091-B | Room 206 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B94 | HB02-0092-A | Room 207 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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(808) 843-0655
FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10965
**Report Date:** 1/14/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B94 | HB02-0092-B | Room 207 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B95 | HB02-0093 | Room 361 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B96 | HB02-0094 | Room 356 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Brown/Black |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10965
**Report Date:** 1/14/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B97 | HB02-0095 | Room 344 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B98 | HB02-0096 | Room 326 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Grey/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B99 | HB02-0097-A | Room 326 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B99 | HB02-0097-B | Room 326 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B100 | HB02-0098-A | Room 344 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B100 | HB02-0098-B | Room 344 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 10965
Report Date: 1/14/02

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 010802-356-JMV-B101 | HB02-0099-A | Room 345 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 010802-356-JMV-B101 | HB02-0099-B | Room 345 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

Layer 1 of 1

| Client ID# | WEC ID# | Location |
|---|---|---|
| 010802-356-JMV-B102 | HB02-0100 | Room 306 |

**Asbestos**

None Detected

| Friable/Non | Fiberous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Plaster | Gray/Tan |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 10965
**Report Date:** 1/14/02

Comments:

**Analyst** [illegible] **Date** 1/14/02
**QC** [illegible] **Date** 1/14/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11131
**Report Date:** 1/23/2002

**Client:** **Soil and Land Use Technology, Inc.**
3375 Koapaka Street Suite B286
Honolulu, HI 96819

**# Samples:** 4 **# Layers:** 7

**Collected Date:** 1/22/2002
**Collected By:** Client
**TAT:** RUSH
**Analysis By:** S. Wells
**Analysis Date:** 1/23/2002
**Received By:** R.Hamasaki
**Received Date:** 1/23/2002

**Project Name/Location:** Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B103 | HB02-308 | 1st. Fl. Rm.180 | 1 of 1 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Wrap | wht./slv./gry |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Fiberous Glass | 15% |
| Cellulose | 25% |

*% Asbestos: None*

*% Other Fibrous Materials: 40%*

*% Non Fibrous Materials: 60%*

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B104 | HB02-309A | 3rd. Fl. Rm.308 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/White |

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

*% Non Fibrous Materials: 100%*

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11131
Report Date: 1/23/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B104 | HB02-309B | 3rd.Fl.Rm.308 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials: 4%*

***% Non Fibrous Materials: 96%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B105 | HB02-310A | 3rd Fl.Rm.308 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Blue/white |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B105 | HB02-310B | 3rd Fl. Rm.308 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials: 4%*

***% Non Fibrous Materials: 96%***

**Sample Comments:**

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200350-0

# Bulk Sample Analysis for Asbestos

**WEC Project #:** H02-038
**Client Project#:** 01-290

**Report #:** 11131
**Report Date:** 1/23/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B106 | HB02-311A | 3rd Fl.Rm.308 | 1 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Asbestos: None*

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

**Sample Comments:**

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012202-356-JSW-B106 | HB02-311B | 3rd Fl. Rm.308 | 2 of 2 |

**Asbestos**

**None Detected**

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Asbestos: None*

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

**Sample Comments:**

Comments:

**Analyst** [illegible] **Date** 1/23/02
**QC** [illegible] **Date** 1/23/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B286
Honolulu, HI 96819

# Samples: 21 # Layers: 31

Collected Date: 1/23/02
Collected By: Client
TAT: RUSH
Analysis By: S. Wells
Analysis Date: 1/23/02
Received By: Hamasaki, R.
Received Date: 1/23/02

Project Name/Location: Schofield Barracks Quad C Bldg. 356

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B107 | HB02-312 | 1st Fl. Rm.159 | 1 of 1 |

Asbestos

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

Other Fibrous Materials

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B108 | HB02-313 | 1st Fl. Rm.159 | 1 of 1 |

Asbestos

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

Other Fibrous Materials

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:28AM SOIL AND LAND USE TECHNOL 808-833-6156 p.6

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 012302-356-KWR-B109 | HB02-314A | 1st Fl. Rm.151 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

Layer 2 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 012302-356-KWR-B109 | HB02-314B | 1st Fl. Rm.151 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | Yes | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 1% |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 99%***

Sample Comments:

---

Layer 1 of 2

| Client ID# | WEC ID# | Location |
|---|---|---|
| 012302-356-KWR-B110 | HB02-315A | 1st Fl. Rm.151 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:29AM SOIL AND LAND USE TECHNOL 808-833-6156 P.7

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B110 | HB02-315B | 1st Fl. Rm.151 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B111 | HB02-316 | 1st Fl. Rm.142 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B112 | HB02-317 | 1st Fl. Rm.142 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:29AM SOIL AND LAND USE TECHNOL 808-833-6156 p.8

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B113 | HB02-318 | 1st Fl. Rm. 144 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|

**Other Fibrous Materials**

None Detected

***% Non Fibrous Materials: 100%***

**Sample Comments:** Sample was not received in batch of samples .

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B114 | HB02-319A | 1st Fl. Rm.144 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Green |

***% Asbestos: None***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | *Trace* |

***% Other Fibrous Materials: Trace***

***% Non Fibrous Materials: 100%***

**Sample Comments:**

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B114 | HB02-319B | 1st Fl. Rm.144 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Adhesive | Grey |

***% Asbestos: None***

**Other Fibrous Materials**

| *Type* | *%* |
|---|---|
| Cellulose | 10% |

***% Other Fibrous Materials: 10%***

***% Non Fibrous Materials: 90%***

**Sample Comments:**



FEB 25 2002 8:29AM SOIL AND LAND USE TECHNOL 808-833-6156 p.9

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B115 | HB02-0320 | 1st Fl. Rm.155 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B116 | HB02-0321 | 1st Fl. Rm.155 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B117 | HB02-0322 | 1st. Fl. Rm. 159 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:30AM SOIL AND LAND USE TECHNOL 808-833-6156 p.10

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B118 | HB02-0323 | 1st Fl. Rm.159 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B119 | HB02-0324A | 1st Fl. Rm.103 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | Trace |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B119 | HB02-0324B | 1st Fl. Rm.103 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 3% |

*% Other Fibrous Materials: 3%*

***% Non Fibrous Materials: 97%***

Sample Comments:



FEB 25 2002 8:30AM SOIL AND LAND USE TECHNOL 808-833-6156 p.11

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B120 | HB02-0325A | 1st Fl. Rm.103 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B120 | HB02-0325B | 1st Fl. Rm.103 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 2% |

*% Other Fibrous Materials: 2%*

***% Non Fibrous Materials: 98%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B121 | HB02-0326A | 3rd. Fl. Hallway 307 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:30AM SOIL AND LAND USE TECHNOL 808-833-6156 p.12

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

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| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B121 | HB02-0326B | 3rd Fl. Hallway 307 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 10% |

*% Other Fibrous Materials: 10%*

***% Non Fibrous Materials: 90%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B122 | HB02-0327A | 3rd Fl. Hallway 305 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B122 | HB02-0327B | 3rd Fl. Hallway 305 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 8% |

*% Other Fibrous Materials: 8%*

***% Non Fibrous Materials: 92%***

Sample Comments:



FEB 25 2002 8:30AM SOIL AND LAND USE TECHNOL 808-833-6156 p.13

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B123 | HB02-0328 | 3rd Fl. Hallway 343 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | *Trace* |

*% Other Fibrous Materials: 35%*

***% Non Fibrous Materials: 65%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B124 | HB02-0329 | 3rd Fl. Hallway 343 | 1 of 1 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Vibration Cloth | Black/White |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Fiberous Glass | 35% |
| Cellulose | *Trace* |

*% Other Fibrous Materials: 35%*

***% Non Fibrous Materials: 65%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B125 | HB02-0330A | 1st Fl. Rm. 124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:



FEB 25 2002 8:30AM SOIL AND LAND USE TECHNOL 808-833-6156 p.14

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B125 | HB02-0330B | 1st Fl. Rm.124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 8% |

*% Other Fibrous Materials: 8%*

***% Non Fibrous Materials: 92%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B126 | HB02-0331A | 1st Fl. Rm.124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

---

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B126 | HB02-0331B | 1st Fl. Rm.124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Grey |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 6% |

*% Other Fibrous Materials: 6%*

***% Non Fibrous Materials: 94%***

Sample Comments:



FEB 25 2002 8:31AM SOIL AND LAND USE TECHNOL 808-833-6156 p.15

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 11143
Report Date: 1/24/02

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B127 | HB02-0332A | 1st Fl. Rm.124 | 1 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Tile | Beige |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | *Trace* |

*% Other Fibrous Materials: Trace*

***% Non Fibrous Materials: 100%***

Sample Comments:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 012302-356-KWR-B127 | HB02-0332B | 1st Fl. Rm.124 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homo-genous | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow/Grey |

*% Asbestos: None*

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 15% |

*% Other Fibrous Materials: 15%*

***% Non Fibrous Materials: 85%***

Sample Comments:

Comments:

Analyst [signature] Date 1/23/02

QC [signature] Date 1/24/02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)



FEB 25 2002 8:31AM SOIL AND LAND USE TECHNOL 808-833-6156 p.16

**Globeteck** NVLAP®
NVLAP ID# 200541-0

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name:*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** W. Bradley
***TAT:*** 3 Days
***Report No:*** 188
***Date Printed:*** 2/26/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 21 ***Total # of Layer(s):*** 21

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B128 | 022202-29 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Hw 368 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B129 | 022202-30 | 2/22/02 | 1 of 1 | Chrysotile | White | <1% |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Hw 34[illegible] **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B130 | 022202-31 | 2/22/02 | 1 of 1 | None Detected | Red/Black | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Hw 305 **Materials:** Multi-layer Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

Globeteck

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report [illegible]es only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were [illegible]ed. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B131 | 022202-32 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Lanai-South **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B132 | 022202-33 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Lanai-Center **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B133 | 022202-34 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 3rd Flr, Lanai-North **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B134 | 022202-35 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Hw 205 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B135 | 022202-36 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Rm 227 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Calcite, Mica

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B136 | 022202-37 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Rm 277 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B137 | 022202-38 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Lanai-North **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B138 | 022202-39 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Lanai-Center **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 021902-356-JSW-B139 | 022202-40 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 2nd Flr, Lanai-South **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B140 | 022202-41 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Rm 174 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica, Calcite

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B141 | 022202-42 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Rm 152 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B142 | 022202-43 | 2/22/02 | 1 of 1 | None Detected | White | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Rm 110 **Materials:** White Composite Dry Wall Material

**Other Fibrous Materials:** Cellulose 10-20% Fibrous Glass 1-3%

**Non-Fibrous Materials:** Gypsum/Binder, Paint, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B143 | 022202-44 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Front-West **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B144 | 022202-45 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Front-Center **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B145 | 022202-46 | 2/22/02 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Front-East **Materials:** Gray Granular Material w/ Paint

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder,Paint,Mineral Grains

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The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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NVLAP ID# 200541-0

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| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B146 | 022202-47 | 2/22/02 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Hw 167 **Materials:** Gray Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B147 | 022202-48 | 2/22/02 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Hw 147 **Materials:** Gray Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 022002-356-JSW-B148 | 022202-49 | 2/22/02 | 1 of 1 | Chrysotile | Gray | <1% |

**Project Name:** Schofield Barracks, Bldg 356, Quad C **Location:** 1st Flr, Hw 165 **Materials:** Gray Granular Material

**Other Fibrous Materials:** None Detected

**Non-Fibrous Materials:** Gypsum/Binder, Mineral Grains

Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report r ''es only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were .d. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** Wm Bradley
**TAT:** Rush
**Report No:** 223
**Date Printed:** 3/8/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 5 **Total # of Layer(s):** 5

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B149 | 030702-06 | 3/7/2002 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg. 356, Quad C, 3rd Floor, Rm 370 **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B150 | 030702-07 | 3/7/2002 | 1 of 1 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg. 356, Quad C, 3rd Floor, Rm 370, **Materials:** Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 030702-356-JSW-B151 | 030702-08 | 3/072002 | 1 of 1 | None Detected | Beige | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg. 356, Quad C, 3rd floor, Rm 368 **Materials:** Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Calcareous Matrix, Mica

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

***Customer Name:*** SaLUT
***Customer Address:*** 3375 Koapaka Street, Honolulu, HI 96819

***Sampled By:*** Client
***Received By:*** M. Rouf
***TAT:*** 72 Hours
***Report No:*** 73
***Date Printed:*** 1/2/2002
***Analyst:*** M. Lee

***Total # of Sample(s):*** 1 ***Total # of Layer(s):*** 2

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 12-13-01-358-JMV-B152 | 123101-05 | 1/2/2002 | 1 of 2 | Chrysotile | Beige | 1-3% |

**Project Name:** Schofield Barracks **Location:** 3rd Floor, Room 368 **Materials:** Beige Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| 12-13-01-358-JMV-B152 | 123101-05 | 1/2/2002 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Schofield Barracks **Location:** 3rd Floor, Room 368 **Materials:** Black Mastic

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Asphalt/Binder

**Analyst:** _____

Mohammad Rouf, MPH, CIHM
Laboratory Director

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.



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WHITE ENVIRONMENTAL CONSULTANTS INC.
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FAX: (808) 843-0657

200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 12083
Report Date: 3/8/2002

Client: Soil and Land Use Technology, Inc.
3375 Koapaka Street Suite B288
Honolulu, HI 96819

# Samples: # Layers: 6

Collection Date: 1/8/2002
Collection By: Client
TAT: RUSH
Analysis By: S. Wells
Analysis Date: 3/8/2002
Received By: Santos, K.
Received Date: 3/8/2002

Project Name/Location: Schofield Barracks Quad C Bldg. 356
Building:

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B85 | HB02-1116 | 1st Floor Room 138 | 2 of 2 |

Asbestos: None Detected

| Friable/Non | Fibrous? | Homogenou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

Other Fibrous Materials

| Type | % |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials:* 5%

*% Non Fibrous Materials:* 95%

Sample Comments: Layer 1 of sample was analyzed prior to analysis of layer 2.

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B86 | HB02-1117 | 1st Floor Room 138 | 2 of 2 |

Asbestos: None Detected

| Friable/Non | Fibrous? | Homogenou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

Other Fibrous Materials

| Type | % |
|---|---|
| Cellulose | 4% |

*% Other Fibrous Materials:* 4%

*% Non Fibrous Materials:* 96%

Sample Comments: Layer one of sample was analyzed prior to analysis of layer 2.

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200350-0

# Bulk Sample Analysis for Asbestos

WEC Project #: H02-038
Client Project#: 01-290

Report #: 12083
Report Date: 3/8/2002

| Client ID# | WEC ID# | Location | Layer |
|---|---|---|---|
| 010802-356-JMV-B87 | HB02-1118 | 1st Floor Room 138 | 2 of 2 |

**Asbestos**

None Detected

| Friable/Non | Fibrous? | Homogenou | Material | Color |
|---|---|---|---|---|
| Non Friable | Yes | No | Mastic | Yellow |

**Other Fibrous Materials**

| Type | % |
|---|---|
| Cellulose | 5% |

*% Other Fibrous Materials: 5%*

*% Non Fibrous Materials: 95%*

Sample Comments: Layer 1 of sample was analyzed prior to analysis of layer 2.

Comments:

Analyst [signature] Date 3/8/02

QC [signature] Date 3-8-02

Analysis performed by EPA Method 600/R-93/116 with dispersion staining microscopy. All quantities reported are based on visual estimation by PLM, unless point-counting method is requested and noted for the sample. Test report relates only to items tested and must not be used by client to claim product endorsement by NVLAP or any agency of the U.S. Government. Test reports must not be reproduced without the approval of WEC Inc., and are subject to WEC Inc. General Terms and Conditions (see reverse). White Environmental Consultants, Inc. is an NVLAP accredited laboratory for bulk asbestos analysis. (Lab# 200350-0)

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2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| **Client Name:** SaLUT | **Project Name:** Quad C - Bldg 356 Schofield Barracks |
| **Project Number:** 01-290 | |
| **Samples Relinquished by:** | **Sample Received by:** K. Santos |
| **Date:** 12-03-01 | **Date:** 12/5/01 @ 9:30 |
| **Samples Relinquished by:** | **Sample Received by:** |
| **Date:** | **Date:** |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 120301-356-JMV | B1 | Rm 377 | 12-03-01 | A | 72 hour |
| | B2 | Rm 377 | | | |
| | B3 | Rm 372 | | | |
| | B4 | Rm 372 | | | |
| | B5 | Rm 365 | | | |
| | B6 | Rm 336 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



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10/1

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 356 Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: Tina Perry-Finau |
| Date: | Date: 12/19/01 |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-19-01 9:10am. |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH [illegible]) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121401-356-JMV | B7 | 1st FLR, Rm 149 | 14 Dec 01 | A | |
| | B8 | 150 | | | |
| | B9 | 150 | | | |
| | B10 | 150 | | | |
| | B11 | 152 | | | |
| | B12 | 161 | | | |
| | B13 | 151 | | | |
| | B14 | 152 | | | |
| | B15 | 145 | | | |
| | B16 | 142 | | | |
| | B17 | 142 | | | |
| | B18 | 142 | | | |
| | B19 | 144 | | | |
| | B20 | 161 | | | |
| | B21 | 155 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: BLDG 356, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-19-01 9:10am |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH 7082) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R |
|---|---|---|---|---|
| 121401-356-JMV | B22 | 1st FLR, Rm 159 | 14 Dec 01 | Accept |
| | B23 | 159 | | |
| | B24 | 2nd FLR, Rm 286 | | |
| | B25 | 286 | | |
| | B26 | 247 | | |
| | B27 | 247 | | |
| | B28 | 247 | | |
| | B29 | 260 | | |
| | B30 | 256 | | |
| | B31 | 1st FLR Rm 108 | | |
| | B32 | 119 | | |
| | B33 | 119 | | |
| | B34 | 115 | | |
| | B35 | 103 | | |
| | B36 | 110 | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Sabut | Project Name: BLDG 356, Schofield Barracks |
| Project Number: 01-290 | |
| Samples Relinquished by: | Sample Received by: S. Santos |
| Date: | Date: 12-19-01 9:10 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1311) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 121401-356-JMV | B37 | 1st FLR, Rm 113 | 14 Dec 01 | Accept | |
| | B38 | 111 | | | |
| | B39 | 111 | | | |
| | B40 | 111 | | | |
| | B41 | 105 | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks, BLDG 356 - Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: [signature] |
| Date: 01-23-02 | Date: 01-23-02 @ 12:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air ([illegible]) Wipe ([illegible] 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead ([illegible] 1131) OTHER (specify analysis and method below)

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time RUSH 24 48 72 HOUR |
|---|---|---|---|---|---|
| 121701-356-JMV | B42 | 2nd FLR, Rm 205 | 17 Dec 01 | | |
| | B47 | 3rd FLR, Rm 308 | | | |
| | B48 | | | | |
| 122801-356-JMV | B61 | 1st FLR, Rm 180 | 28 Dec 01 | | |
| | B62 | Rm 164 | | | |
| 012202-356-JSW | B103 | | 22 Jan 02 | | |
| | B104 | 3rd FLR, Rm 308 | | | |
| | B105 | | | | |
| | B106 | | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg #356 Quad C Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 1-7-02 @ 3:20 |
| Samples Relinquished by: [signature] | Sample Received by: |
| Date: 1/7/02 | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| [redacted] | B43 | Rm 206 | 12-27-02 | Accepted | |
| [redacted] | B45 | Rm 220 | | | 72 HR. |
| 122801-356-JMV | B44 | Rm 203 | 12-28-01 | | |
| | B68 | Rm 274 | | | |
| | B53 | Rm 166 | | | |
| | B54 | Rm 164 | | | |
| | B57 | Rm 172 | | | |
| | B58 | Rm 170 | | | |
| | B64 | Rm 162 | | | |
| | B65 | Rm 162 | | | |
| | B67 | Rm 162 | | | |
| | B69 | Hallway in | | | |
| | B70 | front of | | | |
| | B71 | Room 265 | | | |
| | | | | | |

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# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg # 356 - Quad C Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: Tipo Perry - Fina | Sample Received by: R. Hamasaki 浜崎 |
| Date: 1/10/02 | Date: 01-10-02 @ 11:15 am Thrs. |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| [illegible] | B[illegible] | R[illegible] 316 | 12/28/01 | accepted | |
| 010802-356-JMU- | B76 | Rm 261 | 01/08/02 | | |
| | B77 | Rm 266 | | | |
| | B78 | Rm 124 | | | |
| | B79 | Rm 124 | | | |
| | B80 | Rm 124 | | | |
| | B81 | Rm 119 | | | |
| | B82 | Rm 140 | | | |
| | B83 | Rm 140 | | | |
| | B84 | Rm 140 | | | |
| | B85 | Rm 138 | | | |
| | B86 | Rm 138 | | | |
| | B87 | Rm 138 | | | |
| | B88 | Rm 221 | | | |
| | B89 | Rm 224 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
QAC Initials [illegible]
G. Slaugenhoup
[illegible]

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaCJT | Project Name: Bldg #356 Quad C Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | |
| Samples Relinquished by: | Sample Received by: K. Santos |
| Date: | Date: 1-7-02 @ 3:20 |
| Samples Relinquished by: | Sample Received by: |
| Date: 1/7/02 | Date: |

**Requested Analysis: ASBESTOS: PCM** (NIOSH 7400A) **PLM** (NIOSH 7403)
**LEAD: Air** (NIOSH 7082) **Wipe** (SW 846-6010) **Paint** (SW 846-7420) **Soil** (846-3050A)
**TCLP for Lead** (SW 846-1131) **OTHER (specify analysis and method below)**

**Turn-around Time**

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 121701-356-INV | B43 | Rm 206 | 12-27-02 | Accepted | |
| ↓ | B45 | Rm 220 | | | |
| [illegible]-356-INV | B44 | Rm 203 | 12-28-01 | | 72 HR. |
| | B68 | Rm 274 | | | |
| | B63 | Rm 166 | | | |
| | B54 | Rm 164 | | | |
| | B57 | Rm 172 | | | |
| | B58 | Rm 170 | | | |
| | B64 | Rm 162 | | | |
| | B66 | Rm 162 | | | |
| | B67 | Rm 162 | | | |
| | B69 | Hallway in | | | |
| | B70 | front of | | | |
| ↓ | B71 | Room 265 | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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G. Slangenhoup Rev. B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg #356 Quad C Schofield Barracks |
| Project Number: 01-290 schofield Barracks | Sample Received by: |
| Samples Relinquished by: | Date: |
| Date: | Sample Received by: K. Santos |
| Samples Relinquished by: | Date: 1-7-02 @ 3:00 |
| Date: | |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 122801-356-Inv | B52 | Rm 180 - ~~[illegible]~~ | 12-28-01 | Accepted | |
| ↓ | B60 | Rm 175 | | | 72 HR |
| | B65 | Rm 162 - Duplicated | | | |
| | | | | | |
| | | Possibly is B66 | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | B66 | Extra Sample | | | |
| | | | | | |
| | | | | | |

*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method. Client correspondence regarding acceptance criteria or other aspects of analytical request.



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2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks BLDG 356 - Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: Josh Wallace | Sample Received by: [illegible] |
| Date: 01-23-02 | Date: 01-23-02 @ 12:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air ([illegible]) Wipe ([illegible] 846-6010) Paint ([illegible] 846-7420) Soil (846-3050A)
TCLP for Lead ([illegible] 1311) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 121701-356-JMV | B42 | 2nd FLR, Rm 205 | 17 Dec 01 | | |
| | B47 | 3rd FLR, Rm 308 | | | |
| | B48 | | | | |
| [redacted] | | [redacted] | 28 Dec 01 | | |
| 012202-356-JSW | B103 | | 22 Jan 02 | | |
| | B104 | 3rd FLR, Rm 308 | | | |
| | B105 | | | | |
| | B106 | | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request



Form 463
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WEC WHITE ENVIRONMENTAL CONSULTANTS INC.
2290 Aiahiro Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLwA | Project Name: |
| Project Number: | |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR 5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 010802-356-JMV | B90 | Rm | 01/08/02 | | |
| | B91 | Rm 228 | | | |
| | B92 | Rm 226 | | | |
| | B93 | Rm 206 | | | |
| | B94 | Rm 207 | | | |
| | B95 | Rm 361 | | | |
| | B96 | Rm 356 | | | |
| | B97 | Rm 344 | | | |
| | B98 | Rm 326 | | | |
| | B99 | Rm 326 | | | |
| | B100 | Rm 344 | | | |
| | B101 | Rm 345 | | | |
| | B102 | Rm 306 | | | |
| | | | | | |
| 12[illegible]-356-JMV | B63 | Rm | 12/28/01 | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
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WEC WHITE ENVIRONMENTAL CONSULTANTS INC

2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLUT | Project Name: Bldg # 356 - Quad C Schofield Barracks |
| Project Number: 01-290 Schofield Barracks | Sample Received by: R. Hamasaki 浜崎 |
| Samples Relinquished by: Tim Perry - Kim | Date: 01-10-02 @ 11:15 am Thrs. |
| Date: 1/10/02 | Sample Received by: |
| Samples Relinquished by: | Date: |
| Date: | |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 876-1131) OTHER (specify analysis and method below)**

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| [redacted] | B57 | Rm 318 | 12/28/01 | accepted | |
| 010802-356-JMU- | B76 | Rm 261 | 01/08/02 | | |
| | B77 | Rm 266 | | | |
| | B78 | Rm 124 | | | |
| | B79 | Rm 124 | | | |
| | B80 | Rm 124 | | | |
| | B81 | Rm 119 | | | |
| | B82 | Rm 140 | | | |
| | B83 | Rm 140 | | | |
| | B84 | Rm 140 | | | |
| | B85 | Rm 138 | | | |
| | B86 | Rm 138 | | | |
| | B87 | Rm 138 | | | |
| | B88 | Rm 221 | | | |
| | B89 | Rm 224 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request.



Form 463
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G. Slaugenhoup Rev B
10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: SaLwA | Project Name: |
| Project Number: | |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)
TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)

Turn-around Time

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | RUSH 24 48 72 HOUR 5 DAY |
|---|---|---|---|---|---|
| 010802-356-JMV | B90 | Rm | 01/08/02 | | |
| | B91 | Rm 228 | | | |
| | B92 | Rm 226 | | | |
| | B93 | Rm 206 | | | |
| | B94 | Rm 207 | | | |
| | B95 | Rm 361 | | | |
| | B96 | Rm 356 | | | |
| | B97 | Rm 344 | | | |
| | B98 | Rm 326 | | | |
| | B99 | Rm 326 | | | |
| | B100 | Rm 344 | | | |
| | B101 | Rm 345 | | | |
| | B102 | Rm 306 | | | |
| | | | | | |
| 122801-356-JMV | B63 | Rm | 12/28/01 | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request.



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10/15/02

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2290 Aiahzo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

Client Name: Salut
Project Number: 01-290
Samples Relinquished by: [illegible]
Date: 01-23-02
Samples Relinquished by:
Date:

Project Name: Schofield Barracks BLDG 356 - Quad C
Sample Received by: [illegible]
Date: 01-23-02 @ 12:45
Sample Received by:
Date:

Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)
LEAD: Air ([illegible]) Wipe ([illegible] 846-6010) Paint ([illegible] 846-7420) Soil (846-3050A)
TCLP for Lead ([illegible] 1311) OTHER (specify analysis and method below)

Turn-around Time: RUSH 24 48 72 HOUR

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 121701-356-JMV | B42 | 2nd FLR, Rm 205 | 17 Dec 01 | | |
| | B47 | 3rd FLR, Rm 308 | | | |
| | B48 | | | | |
| 122801-356-JMV | B61 | 1st FLR, Rm 180 | 28 Dec 01 | | |
| | B62 | Rm 164 | | | |
| | B63 | | | | |
| | B64 | 3rd FLR, Rm 308 | 22 Jan 02 | | |
| | B65 | | | | |
| | B66 | | | | |

*All samples submitted to WEC Inc shall be sealed in the appropriate container, cassidge, or collection vessel, shall be free of exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method
Client correspondence regarding acceptance criteria or other aspects of analytical request



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10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Aiahuo Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salient | Project Name: Schofield Barracks, BLDG 356-QuadC |
| Project Number: 01-290 | |
| Samples Relinquished by: [illegible] | Sample Received by: [illegible] |
| Date: 01-23-02 | Date: 01-23-02 @ 12:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air (NIOSH [illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

Turn-around Time: RUSH 24 48 72 HOUR

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | Turn-around Time |
|---|---|---|---|---|---|
| 012302-356-QuadC | B107 | 1st FLR, Rm 159 | 23 Jan 02 | | |
| | B108 | ↓ | | | |
| | B109 | Rm 151 | | | |
| | B110 | ↓ | | | |
| | B111 | Rm 142 | | | |
| | B112 | ↓ | | | |
| | B113 | Rm 144 | | | |
| | B114 | ↓ | | | |
| | B115 | Rm 155 | | | |
| | B116 | ↓ | | | |
| | B117 | Rm 159 | | | |
| | B118 | ↓ | | | |
| | B119 | Rm 103 | | | |
| | B120 | ↓ | | | |
| | B121 | 3rd FLR, Hallway 307 | | | |

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Client correspondence regarding acceptance criteria or other aspects of analytical request:



Form 463
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10/15/01

WEC WHITE ENVIRONMENTAL CONSULTANTS INC
2290 Alahao Place Unit 301 Honolulu, HI 96819-2283 phone: 808-843-0655 fax: 808-843-0657

# Sample Chain of Custody

| | |
|---|---|
| Client Name: Salut | Project Name: Schofield Barracks, BLDG 356 - Quad C |
| Project Number: 01-290 | |
| Samples Relinquished by: John Willard | Sample Received by: [illegible] |
| Date: 01-23-02 | Date: 01.23.02 @ 12:45 |
| Samples Relinquished by: | Sample Received by: |
| Date: | Date: |

**Requested Analysis: ASBESTOS: PCM (NIOSH 7400A) PLM (NIOSH 7403)**
**LEAD: Air ([illegible]) Wipe (SW 846-6010) Paint (SW 846-7420) Soil (846-3050A)**
**TCLP for Lead (SW 846-1131) OTHER (specify analysis and method below)**

Turn-around Time
RUSH
24 48 72 HOUR
5 DAY

| Client Number | Sample code | Sample Location | Collection Date | Sample A/R | |
|---|---|---|---|---|---|
| 012302-356-[illegible] | B122 | 3rd FLR, Hallway 305 | 23 Jan 02 | | |
| | B123 | 343 | | | |
| | B124 | | | | |
| | B125 | 1st FLR, Rm 124 | | | |
| | B126 | | | | |
| | B127 | | | | |
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*All samples submitted to WEC Inc. shall be sealed in the appropriate container, cartridge, or collection vessel, shall be free if exterior dust or contamination, and pose no immediate or potential hazard to personnel during sample receiving and processing. When applicable, please include field blanks as required by sampling method.
Client correspondence regarding acceptance criteria or other aspects of analytical request.



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10/15/01

pg 1 of 3

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

022202-

Project Name: Schofield Barracks, BLDG 356-Quad C
Client: Salut
Project # 01-290
Sampled by: JSW
Sample Date: 02/19, 02/20/02
Turn Around Time: ~~5 Day~~ 3 Day

ANALYSIS REQUESTED: Asbestos (PLM/PCM), Lead Air/Wipe, Lead Paint/Soil, TCLP Pb, TCLP 8 Metals, Arsenic Samples, Total RCRA 8 Metals

| | SAMPLE ID | LOCATION |
|---|---|---|
| 29 | 21902-356-JSW-B128 | 3rd FLR, HW 368 |
| 30 | B129 | HW 334 |
| 31 | B130 | HW 305 |
| 32 | B131 | Lanai - South |
| 33 | B132 | - Center |
| 34 | B133 | - North |
| 35 | B134 | 2nd FLR, HW 205 |
| 36 | B135 | Rm 227 |
| 37 | B136 | Rm 277 |
| 38 | B137 | Lanai - North |

| Relinquished by: | Received by: W. Bradley | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 | Time/Date: 2/22/02 | Time/Date: |

pg 2 of 3

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

022202-

Project Name: SB, BLDG 356 - Quad C
Client:
Project #
Sampled by:
Sample Date: 02/19, 02/20/02
Turn Around Time:

ANALYSIS REQUESTED: Asbestos PLM/PCM; Lead Air/Wipe; Lead Paint/Soil; TCLP Pb; TCLP 8 Metals; Arsenic Samples; Total RCRA 8 Metals

| | SAMPLE ID | LOCATION |
|---|---|---|
| 39 | 21902-356-SW-B138 | 2nd FLR, Lanai - Center |
| 40 | B139 | L - South |
| 41 | 22002-356-SW-B140 | 1st FLR, Rm 174 |
| 42 | B141 | Rm 152 |
| 43 | B142 | Rm 110 |
| 44 | B143 | Front - West |
| 45 | B144 | - Center |
| 46 | B145 | - East |
| 47 | B146 | HW 167 |
| 48 | B147 | HW 147 |

| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 @ 10am | Time/Date: | Time/Date: |

pg 3 of 3

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Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

022202 -

Project Name: SB, BLDG 356 - Quad C
Client:
Project #
Sampled by:
Sample Date: 02/20/02
Turn Around Time:

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 49 120202-356-SSW-B148 | 1st FLR, Hw 105 | 1 | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 2/22/02 | Time/Date: | Time/Date: |

**Laboratory Quality Control Results**
**And**
**Chains of Custody**

Globeteck NVLAP NVLAP ID# 200541-0

544 Ohohia Street, Suite 2, Honolulu, HI 96819, Phone : (808) 833-5787, Fax: (808) 833-5987

# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St.
Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72-hr
**Report No:** 259-02
**Date Printed:** 12/6/2001

**Total # of Sample(s):** 8 **Total # of Layer(s):** 11 **Analyst:** M. Lee

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B5 | 120601-02 | 12/5/2001 | 12/6/2001 | 1 of 1 | Non-Detected | Light Gray | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #356-Rm365 **Materials:** Gray Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcarous Matrix, Vinyl, Binder Calcite
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| [illegible]41 | 120601-03 | 12/5/2001 | 12/6/2001 | [illegible] of [illegible] | Non-Detected | Gray | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #357-Rm248 **Materials:** Gray Cloth
**Other Fiberious Materials:** Fibrous Glass 30-40%
**Non Fiberous Materials:** Glue, Mica, Binder Calcite
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B46 | 120601-04 | 12/5/2001 | 12/6/2001 | 1 of 2 | Chrysotile | Green | 1-3% |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #357-Rm256 **Materials:** Green Floor Tile
**Other Fiberious Materials:**
**Non Fiberous Materials:** Calcarous Matrix
**Sample Comments:**

Globeteck

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report applies only to the sample(s) received and tested by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were derived. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

# Globeteck

NVLAP ID# 200541-0

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| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B46 | 120601-04 | 12/5/2001 | 12/6/2001 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #357-Rm256 **Materials:** Black Mastic

**Other Fiberious Materials:**

**Non Fiberous Materials:** Asphalt, Binder Calcite

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B39 | 120601-05 | 12/5/2001 | 12/6/2001 | 1 of 1 | Non-Detected | Beige | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm226 **Materials:** Beige Floor Tile

**Other Fiberious Materials:** Cellulose 1-3%

**Non Fiberous Materials:** Calcarous Matrix

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B44 | 120601-06 | 12/5/2001 | 12/6/2001 | 1 of 1 | Non-Detected | Beige | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm384 **Materials:** Beige Floor Tile

**Other Fiberious Materials:**

**Non Fiberous Materials:** Calcarous Matrix, Mica

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B49 | 120601-07 | 12/5/2001 | 12/6/2001 | 1 of 1 | Non-Detected | Tan | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm140 **Materials:** Tan Floor Tile

**Other Fiberious Materials:**

**Non Fiberous Materials:** Calcarous Matrix, Mica

**Sample Comments:**

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| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B54 | 120601-08 | 12/5/2001 | 12/6/2001 | 1 of 2 | Non-Detected | Blue | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm122 **Materials:** Blue Floor Tile

**Other Fiberious Materials:**

**Non Fiberous Materials:** Calcarous Matrix, Mica

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B54 | 120601-08 | 12/5/2001 | 12/6/2001 | 2 of 2 | Non-Detected | Brown | N/A |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm122 **Materials:** Brown Glue

**Other Fiberious Materials:**

**Non Fiberous Materials:** Glue, Binder Calcite

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B59 | 120601-09 | 12/5/2001 | 12/6/2001 | 1 of 2 | Chrysotile | Beige | 1-3% |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm122 **Materials:** Beige Floor Tile

**Other Fiberious Materials:**

**Non Fiberous Materials:** Calcarous Matrix, Vinyl, Binder Calcite

**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| B59 | 120601-09 | 12/5/2001 | 12/6/2001 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Quad C Schofield Barracks **Location:** Bldg. #358-Rm122 **Materials:** Black Mastic

**Other Fiberious Materials:**

**Non Fiberous Materials:** Asphalt, Binder Calcite

**Sample Comments:**

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Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

Globeteck

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** G. Imamura
**TAT:** 5 Days
**Report No:** 86
**Date Printed** 1/15/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 4

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 010802-356-JMV-B81 | 011102-66 | 1/14/2002 | 1/14/2002 | 1 of 2 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg 356, Quad C, Room 119 **Materials:** Floor Tile

**Other Fibrous Materials:** Non-Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 010802-356-JMV-B81 | 011102-66 | 1/14/2002 | 1/14/2002 | 2 of 2 | Chrysotile | Black | 3-5% |

**Project Name:** Schofield Barracks **Location:** Bldg 356, Quad C, Room 119 **Materials:** Black Asphaltic Material

**Other Fibrous Materials:** Non-Detected
**Non-Fibrous Materials:** Asphalt/Binder, Calcite

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 010802-356-JMV-B101 | 011102-67 | 1/14/2002 | 1/14/2002 | 1 of 2 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg 356, Quad C, Room 345 **Materials:** Floor Tile

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Calcareous Matrix, Mica

The result quantitations reported are an estimation based on the methods of visual microscopic estimation which is considered only a semi-quantitative technique. This report ıs only to the sample(s) received and analyzed by GLOBETECK. Results do not necessarily reflect the makeup of the entire span of the material from which the samples were ɟd. Sampling techniques and/or sample handling may affect the integrity of the sample/s before submission to GLOBETECK. Laboratory and hence the outcome of the laboratory results. Samples not destroyed by testing are retained a minimum of thirty days. GLOBETECK Laboratory, recommends re-analysis by point count or Transmission Electron Microscopy (TEM) for materials that are found to contain less than ten percent (<10%) asbestos by PLM. This report cannot be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government. This report shall not be reproduced except in full, without the written consent of GLOBETECK.

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| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 010802-356-JMV-B101 | 011102-67 | 1/14/2002 | 1/14/2002 | 2 of 2 | None Detected | Yellow | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg 356, Quad C, Room 345 **Materials:** Yellow Mastic

**Other Fibrous Materials:** Cellulose 1-3%

**Non-Fibrous Materials:** Adhesive/Binder, Calcite

**Analyst:** _____

Mohammad Rouf, MRH, CHMM
Laboratory Director

Globeteck

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## Bulk Asbestos Analysis

### EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3375 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 53
**Date Printed:** 1/3/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121701-356-JMV-B50 | 010202-12 | 12/26/2001 | 1/3/2002 | 1 of 1 | Non-Detected | Gray | N/A |

**Project Name:** Schofield Barracks Bldg. 356 **Location:** Bldg. 356, Room 317 **Materials:** Compressed Fibrous Materials

**Other Fiberious Materials:** Cellulose 30-40%, Mineral Wool 10-20%
**Non Fiberous Materials:** Perlite, Glass Beads, Paint, Glue/Binder
**Sample Comments:**

Globeteck

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** G. Imamura
**TAT:** 5 Days
**Report No:** 75
**Date Printed** 1/9/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 2

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 121701-356-JMV-B43 | 010802-02 | 1/8/2002 | 1/8/2002 | 1 of 2 | None Detected | Tan | N/A |

**Project Name:** Schofield Barracks **Location:** Bldg.# 356, Quad C, Room 206 **Materials:** Tan Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcareous Matrix, Mica

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|---|
| 121701-356-JMV-B43 | 010802-02 | 1/8/2002 | 1/8/2002 | 2 of 2 | Chrysotile | Black | 1-3% |

**Project Name:** Schofield Barracks **Location:** Bldg.# 356, Quad C, Room 206 **Materials:** Black Asphaltic Mastic

**Other Fibrous Materials:** Cellulose 1-3%
**Non-Fibrous Materials:** Asphalt/Binder, Calcite

**Analyst:** _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Client Name:** SaLUT
**Client Address:** 3357 Koapaka St. Honolulu, HI 96819

**Collected By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 45
**Date Printed:** 1/2/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 2 **Total # of Layer(s):** 3

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121401-356-JMV-B19 | 010202-01 | 12/14/2001 | 1/2/2002 | 1 of 2 | Chrysotile | Green | 1-3% |

**Project Name:** Building #356, Schofield Barracks **Location:** Room 144 **Materials:** Green Floor Tile
**Other Fiberious Materials:** Non-Detected
**Non Fiberous Materials:** Calcareous Matrix, Mica
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121401-356-JMV-B19 | 010202-01 | 12/14/2001 | 1/2/2002 | 2 of 2 | Non-Detected | Brown | N/A |

**Project Name:** Building #356, Schofield Barracks **Location:** Room 144 **Materials:** Brown Mastic
**Other Fiberious Materials:** Non-Detected
**Non Fiberous Materials:** Adhesive/Binder, Calcite
**Sample Comments:**

| Client ID | Lab ID | Received Date | Date Analyzed | Layer | Asbestos Type | Color | Percent in Layer |
|---|---|---|---|---|---|---|---|
| 121401-356-JMV-B38 | 010202-02 | 12/14/2001 | 1/2/2002 | 1 of 1 | Non- Detected | Light Gray | N/A |

**Project Name:** Building #356, Schofield Barracks **Location:** Room 111 **Materials:** Gray Floor Tile
**Other Fiberious Materials:** Non-Detected
**Non Fiberous Materials:** Calcareous Matrix, Mica
**Sample Comments:**

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Analyst: _____

Mohammad Rouf, MPH, CHMM
Laboratory Director

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# Bulk Asbestos Analysis

## EPA Method 600/R-93-116, Visual Area Estimation

**Customer Name:** SaLUT
**Customer Address:** 3375 Koapaka Street, Honolulu, HI 96819

**Sampled By:** Client
**Received By:** M. Rouf
**TAT:** 72 Hours
**Report No:** 108
**Date Printed:** 1/23/2002
**Analyst:** M. Lee

**Total # of Sample(s):** 1 **Total # of Layer(s):** 1

| Client ID | Lab ID | Date Analyzed | Layer | Asbestos Type | Color | Percent |
|---|---|---|---|---|---|---|
| B5 | 120601-02 | 12/6/1 | 1 of 1 | None Detected | Gray | N/A |

**Project Name:** Quad D, Schofield Barracks **Location:** Bldg #356, Room 365 **Materials:** Gray Floor Tile

**Other Fibrous Materials:** None Detected
**Non-Fibrous Materials:** Calcerous Matrix, Vinyl, Binder Calcite

**Analyst:** _____

for Mohammad Rouf, MPH, CHMM
Laboratory Director

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# AMA Analytical Services, Inc.

Electron & Optical Microscopy Services

NVLAP
NY ELAP
AIHA

## CERTIFICATE OF ANALYSIS

| | | | | | |
|---|---|---|---|---|---|
| Client: | SaLUT, Inc. | Job Name: | Schofield Barracks | Chain Of Custody: | 92215 |
| Address: | 11609 Edmonston Road | Job Location: | Building 356 - Quad C | Date Analyzed: | 04/30/2002 |
| | Beltsville, Maryland 20705 | Job Number: | 01-290 | Person Submitting: | Ken Reynolds |
| | | P.O. Number: | Not Provided | | |
| Attention: | Tina Perry-Finau | | | | |



## Summary of Polarized Light Microscopy

| AMA Sample Number | Client Sample # | Total Asbestos | Chrysotile Percent | Amosite Percent | Crocidolite Percent | Other Asbestos Percent | Mineral Wool Percent | Fiberglass Percent | Organic Percent | Synthetic Percent | Other Percent | Particulate Percent | Sample Color | Analyst ID | Comments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0244057 | 120301-356-JMV-B5 | NAD | – | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |
| 0244058 | 121401-356-JMV-B19 | NAD | – | – | – | – | – | – | – | – | – | 100 | Green | LB | |
| 0244059 | 121401-356-JMV-B38 | NAD | – | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |
| 0244060 | 121401-356-JMV-B43 | NAD | – | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |
| 0244061 | 010802-356-JMV-B81 | NAD | – | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |
| 0244062 | 010802-356-JMV-B101 | NAD | – | – | – | – | – | – | – | – | – | 100 | Off-White | LB | |

The following footnotes only apply to those samples which the total asbestos result is flagged with a note number.

1 TEM RECOMMENDATION - Please note, due to resolution limitations with optical microscopy and/or interference from matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos. It is recommended that the additional analytical technique of TEM be used to check for asbestos fibers below the resolution limits of optical microscopy.

2 MATRIX REDUCTION RECOMMENDATION - Please note, due to interference from the matrix components of this sample, results which are reported via PLM as negative or trace (<1%) for asbestos may contain a significant quantity of asbestos which is obscured from view. It is recommended that the additional preparation technique of gravimetric reduction be performed on this sample to minimize the obscuring effects of matrix components, followed by reanalysis by PLM and/or TEM.

Analysis Method - EPA/600/R-93/116 dated July 1993

NAD = "No Asbestos Detected" TR = "Trace equals less than 1% of this component"

Luis Bustillos

This report applies only to the sample, or samples, investigated and is not necessarily indicative of the quality or condition apparently identical or similar products. As a mutual protection to clients, the public and these Laboratories, this report is submitted and accepted for the exclusive use of the client to whom it is addressed and upon the condition that it is not to be used, in whole or in part, in any advertising or publicity matter without prior written authorization from us. Sample types, locations and collection protocols are based upon the information provided by the persons submitting them and, unless collected by personnel of these Laboratories, we expressly disclaim any knowledge and liability for the accuracy and completeness of this information. Residual sample material will be discarded in acc[illegible]nce with the appropriate regulatory guidelines, unless otherwise requested by the client. [illegible]AP Accreditation applies only to polar[illegible]ight microscopy of bulk samples and transmission electron microscopy of AHERA air sa[illegible]

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Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Schofield Barracks
Client: SaLUT
Project # 01-290 Schofield Barracks
Sampled by: JMV
Sample Date: ~~01/08/02~~ 7/11/02
Turn Around Time: 5 day

7/11/02

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals |
|---|---|---|---|---|---|---|---|---|
| 010702-356-JMV | | | | | | | | |
| 66 - B81 | Rm 119 Bldg #356 - Quad C | ✓ | | | | | | |
| 67 - B101 | Rm 345 " " " | ✓ | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: | Time/Date: | Time/Date: |

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# CHAIN OF CUSTODY

Project Name: Bldg # 356 Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-17-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 0202-12 121701-356-JMV-B50 | Rm 317 | | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 12/26/01 | Time/Date: | Time/Date: |

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Schofield Barracks
Client: SaLuT
Project # 01-290 Schofield Barracks
Sampled by: JMV
Sample Date: 12-17-01
Turn Around Time: 5 day

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 0802-02 121701-356-JMV-B43 | Rm 206 - Quad C, Bldg #356 | | | | | | | | |
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| Relinquished by: | Received by: | Relinquished by: |
|---|---|---|
| Signature: | Signature: | Signature: |
| Time/Date: 1/7/02 3:00pm. | Time/Date: 1/8/02 3pm | Time/Date: |

Globeteck Group, Inc
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Bldg # 356 - Schofield Barracks
Client: SaLUT
Project # 01-290
Sampled by: JMV
Sample Date: 12-14-01
Turn Around Time: 72 hour

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 10202-01 121401-356-JMV-B19 | Rm 144 | ✓ | | | | | | | |
| 02 121401-356-JMV-B38 | Rm 111 | ✓ | | | | | | | |

| | | |
|---|---|---|
| Relinquished by: [illegible] | Received by: G. Imamura | Relinquished by: |
| Signature: [illegible] | Signature: G Imamura | Signature: |
| Time/Date: 12/15/01 | Time/Date: 1/2/02 | Time/Date: |

**Globeteck Group, Inc**
544 Ohohia Street, Suite #4
Honolulu, Hawaii 96819
Phone (808) 833-5787 Fax (808) 833-5987

# CHAIN OF CUSTODY

Project Name: Quad C Schofield Barracks
Client: Salut
Project # 01-290
Sampled by: JMV
Sample Date: 3 Dec 01
Turn Around Time: 72 HRS

ANALYSIS REQUESTED

| SAMPLE ID | LOCATION | Asbestos PLM/PCM | Lead Air/Wipe | Lead Paint/Soil | TCLP Pb | TCLP 8 Metals | Arsenic Samples | Total RCRA 8 Metals | |
|---|---|---|---|---|---|---|---|---|---|
| 20501-02 B5 | BLDG 356, Rm 365 | ✓ | | | | | | | |
| 03 B41 | BLDG 357, Rm 249 | | | | | | | | |
| 04 B46 | BLDG 357, Rm 256 | | | | | | | | |
| 05 B39 | BLDG 358, Rm 226 | | | | | | | | |
| 06 B44 | " " , Rm 384 | | | | | | | | |
| 07 B49 | " " , Rm 140 | | | | | | | | |
| 08 B54 | " " , Rm 122 | | | | | | | | |
| 09 B59 | " " , Rm 122 | ✓ | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

| | | |
|---|---|---|
| Relinquished by: K. Reynolds | Received by: | Relinquished by: |
| Signature: K. Reynolds | Signature: Marina Lee | Signature: |
| Time/Date: | Time/Date: 12/5/01 9:30 Am | Time/Date: |

**AMA Analytical Services, Inc.**

AIHA (#8863) NVLAP (#1143) NY ELAP (10920)
4475 Forbes Blvd. • Lanham, MD 20706
(301) 459-2640 • (800) 346-0961 • Fax (301) 459-2643

# CHAIN OF CUSTODY

(Please Refer To This Number For Inquires) 92215

**MAILING ADDRESS:**

1. Submittal Date: 29 MAR 02 — Job Name/location: Schofield Barracks, BLDG 356 - Quad C
2. Client Name: SALUT — Job #: 01-290 — P.O. #:
3. Street/RFD/P.O. Box: 3375 Koapaka St. STE B236 — Bill To: SALUT
4. City, State, Zip: Hon. Hi. 96819 — Phone #: 808-833-6155 — Fax: 808-833-6156
5. Contact Person: Tina Perry-Finay — Submitted By: Ken Reynolds (Print) Ken Reynolds (Signature)
6. DATE & TIME RESULTS REQUIRED: 4/30/02 Time: 1200 AM PM ☐ IMMED. ☐ 24HR ☐ 48HR ☐ 72HR ☒ 5-DAY OTHER(Specify):

**SAMPLE DATA:**

1. Analysis Type: ☒ Asbestos ☐ Lead ☐ NOB-Whole(PLM/TEM) ☒ NOB-Whole(PLM Only) ☐ NOB-Whole(TEM Only) ☐ NOB-Res. Ash(TEM) ☐ TCLP for Pb ☐ Other(specify):
2. Total Number Of Samples: TEM ____ PCM ____ PLM 6 LEAD ____ OTHER (Specify) ____
3. ELECTRON MICROSCOPY SAMPLES: A. Filter Type: PC ☐ MCE ☐ B. Porosity ____ Micron C. Diameter ☐ 37mm ☐ 25mm
4. LEAD SAMPLES: Wipe Type: ☐ Pace ☐ Palmiest ☐ Ghost ☐ Lynx Products ☐ Other (specify)
5. Release Criteria/Analytical Sensitivity: 0.010 f/cc ☐ 0.005 f/cc ☐ AHERA ☐ %ASBESTOS ☐ S/FT² ☐ OTHER ☐
6. Field Sheet Attached? ☐ YES ☒ NO If No Then Please Complete The Following:

**SAMPLE ANALYSIS INFORMATION** / **ANALYSIS** / **MATRIX**

| CLIENT ID NUMBER | AMA ID NUMBER | SAMPLE LOCATION | DATE | VOLUME (LITERS) | WIPE AREA | TEM | PCM | PLM | LEAD | OTHER | AIR | BLANK | BULK | WIPE | OTHER |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 120301-356-JMV-B5 | | 3rd FLR, Rm 345 | 12/03/01 | | | | | | | | | | | | |
| 121401-356-JMV-B19 | | 1st FLR, Rm 144 | 12/14/01 | | | | | | | | | | | | |
| 121401-356-JMV-B38 | | 1st FLR, Rm 144 | 12/14/01 | | | | | | | | | | | | |
| 121701-356-JMV-B43 | | 2nd FLR, Rm 206 | 12/17/01 | | | | | | | | | | | | |
| 010802-356-JMV-B31 | | 1st FLR, HW326 | 01/08/02 | | | | | | | | | | | | |
| 010802-356-JMV-B101 | | 3rd FLR, HW345 | 01/08/02 | | | | | | | | | | | | |

**REPORTING DATA:**

1. Verbal Results To Whom? Name: ____ Phone: ____ Beeper: ____
2. Date Written Results Required ____ / ____ / ____

**LABORATORY STAFF ONLY (CUSTODY)**

1. Date/Time RCVD: 4/23/02 @ 1200 Via: [illegible] By (Print): [illegible] Sign: [illegible]
2. Date/Time Analyzed: 4/30/02 @ ____ By (Print): [illegible] Sign: [illegible]
3. Results Reported To: T. Perry-Finay Via: [illegible] Date: 4/30/02 Time: ____ Initials: [illegible]
4. Comments:

ATTACHMENT 23

WATER DISTRIBUTION ANALYSIS

# FY03 MCA WBR, Quad C (Bldg 355, 356, 357, 358)
## WATER DISTRIBUTION ANALYSIS

### CALCULATION OF AVAILABLE FLOW FOR FIRE SPRINKLER LINE:

HYDRANT FLOW TEST 4 Dec 98
DATA: FLOW HYDRANT #D-12 (FLOW) & D-13 STATIC/RESIDUAL

STATIC PRESSURE (Ps)= 60

RESIDUAL PRESSURE (Pr)= 55

TEST FLOW (Qr)= 915

**CALCULATION FOR PEAK FLOW DEMAND (QP) FOR BKS BLDGS:**
Quad C (BKS: Bldg 356, 358)

QP = REQUIRED HYDRANT FLOW(QH) +
DOMESTIC FLOW(QD) + FIRE SPRINKLER FLOW(QF)

QH = 250 DURATION- 45 MINUTES - LIGHT HAZARD
Based on Pop of 602: OCCUPANCY PER MIL-HDBK-1008C
QD = 73 Extreme Peak based on BKS Pop of 600 (4x actual pop of bks)

QF = 700 700 GPM @ 35 psig (OR 400 GPM @ 44, SEE BELOW)

**QP = 1023 GPM @ 44 PSI (PER MECH SEC)**

**AVAILABLE PRESSURE AT RISER FOR 6" FIRE SPRINKLER LINE**

RESIDUAL PRESSURE AT TEST HYDRANT AT REQUIRED FLOW:

P = Ps - (Ps - Pr)(QP/Qr) ^ 1/0.54

**P = 53.85 PSI** > 35 PSI

ASSUME 12" MAIN SAME AS FHY FLOW

| ITEM | Q | LF MAX | Hf | | LOSSES FT | |
|---|---|---|---|---|---|---|
| 8" WATER LINE | 540 | 250 | 0.006 | = | 1.5 | LOOPED: USE HALF FLOW |
| 6" WATER LINE | 700 | 71 | 0.0354 | = | 2.513 | |
| TEE (20+7) | | 27 | 0.0354 | = | 0.956 | |
| PIV | | 10 | 0.0354 | = | 0.354 | |
| 2-VALVES (2X2.5) | | 5 | 0.0354 | = | 0.177 | |
| SUBTOTAL (LOSSES IN FT) | | | | | 5.5 | |
| LOSSES IN PSI | | | | | 2.384 | |
| DOUBLE CHECK VALVE LOSS | | | | | 3.10 | |
| | | TOTAL LOSSE= | | | 5.484 | |

**TOTAL AVAILABLE PRESSURE AT BLDG FOR SPRINKLER WATER SUPPLY:**

**P = 48.37 PSI > 35 PSI REQD OK**

## CALCULATION OF AVAILABLE FLOW FOR FIRE SPRINKLER LINE:

HYDRANT FLOW TEST 4 Dec 98

DATA: FLOW HYDRANT #D-12 (FLOW) & D-13 STATIC/RESIDUAL

STATIC PRESSURE (Ps)= 60

RESIDUAL PRESSURE (Pr)= 55

TEST FLOW (Qr)= 915

**CALCULATION FOR PEAK FLOW DEMAND (QP) FOR OFFICES/ADMIN:**

Quad C (COF/BN HQ: Bldg 355 & 357) WORST CASE BLDG 355 (3 MED COF, 1 LGE COF; 1 BN HQ

QP = REQUIRED HYDRANT FLOW(QH) +
DOMESTIC FLOW(QD) + FIRE SPRINKLER FLOW(QF)

QH = 500 DURATION- 45 MINUTES - --

Based on Pop of 602: LIGHT HAZARD OCCUPANCY PER MIL-HDBK-1008C

QD = 130 Extreme Peak based on FU (BLDG 355)

QF = 700 700 GPM @ 35 psig (OR 400 GPM @ 44, SEE BELOW)

**QP = 1330 GPM @ 44 PSI (PER MECH SEC)**

**AVAILABLE PRESSURE AT RISER FOR 6" FIRE SPRINKLER LINE**

RESIDUAL PRESSURE AT TEST HYDRANT AT REQUIRED FLOW:

P = Ps - (Ps - Pr)(QP/Qr) ^ 1/0.54

**P = 50.01 PSI** > 44 PSI

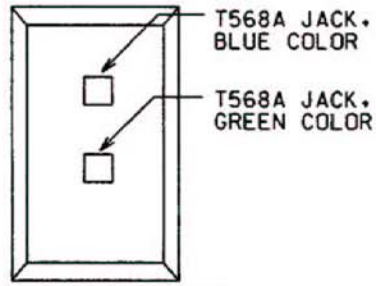
| ITEM | Q | LF MAX | Hf | | LOSSES FT | |
|---|---|---|---|---|---|---|
| 8" WATER LINE | 540 | 250 | 0.006 | = | 1.5 | LOOPED: USE HALF FLOW |
| 6" WATER LINE | 700 | 71 | 0.0354 | = | 2.513 | |
| TEE (20+7) | | 27 | 0.0354 | = | 0.956 | |
| PIV | | 10 | 0.0354 | = | 0.354 | |
| 2-VALVES (2X2.5) | | 5 | 0.0354 | = | 0.177 | |
| SUBTOTAL (LOSSES IN FT) | | | | | 5.5 | |
| LOSSES IN PSI | | | | | 2.384 | |
| DOUBLE CHECK VALVE LOSS | | | | | 3.10 | |
| | | TOTAL LOSSE= | | | 5.484 | |

**TOTAL AVAILABLE PRESSURE AT BLDG FOR SPRINKLER WATER SUPPLY:**

**P = 44.52 PSI > 44 PSI (& 35 PSI MIN) OK**

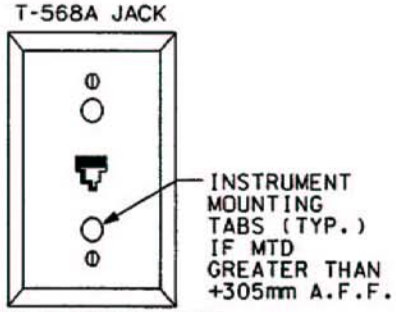
ATTACHMENT 24

TELECOMM DETAILS



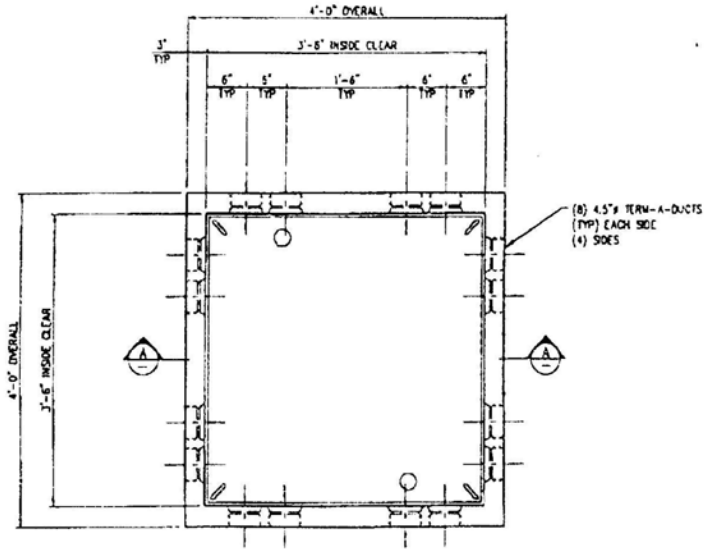

(SINGLE-GANG PLATE)
(DOUBLE-GANG BOX)

TYPICAL TYPE "B"
COMMUNICATIONS OUTLET
NOT TO SCALE

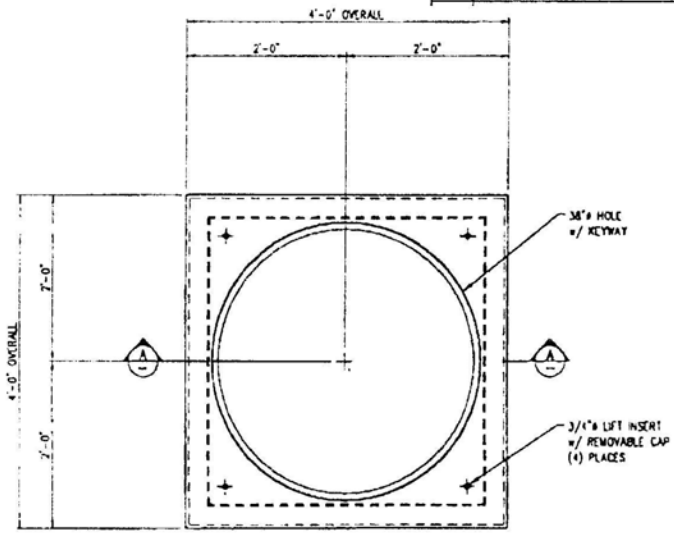



(SINGLE-GANG PLATE)
(DOUBLE-GANG BOX)

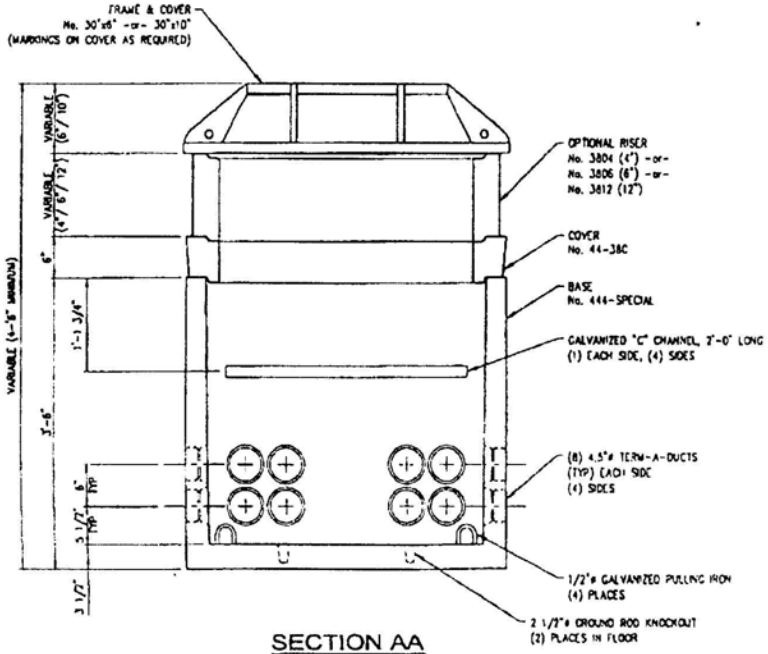
TYPICAL TYPE "W"
COMMUNICATIONS OUTLET
NOT TO SCALE




## PLAN VIEW
SPECIAL BASE SECTION




## PLAN VIEW
STANDARD TOP SECTION
(No. 44-38C)




## SECTION AA

### SHIPPING WEIGHT

| | |
|---|---|
| FRAME & COVER (6" / 10") = | 600 lbs / 800 lbs |
| OPTIONAL RISER (4" / 6" / 12") = | 190 lbs / 280 lbs / 540 lbs |
| COVER SECTION = | 680 lbs |
| BASE SECTION = | 2,850 lbs |

### INSERTS

| | |
|---|---|
| OPTIONAL RISER = | (3) 3/4"ø FERRULE LOOP |
| COVER SECTION = | (4) 3/4"ø FERRULE LOOP w/CAP |
| BASE SECTION = | (4) 1/2"ø GALVANIZED PULLING IRON |

**SHOP NOTES:**
REMOVE LIFT HOLES FROM PRODUCT WALLS

### STRUCTURAL NOTES

1. CONCRETE – 28 DAY COMPRESSIVE STRENGTH f'c = 4500 psi
2. REBAR – ASTM A-615 GRADE 60
3. MESH – ASTM A-185 GRADE 65
4. DESIGN – ACI-318-99 BUILDING CODE
5. LOADS – H-20 TRUCK WHEEL, P=16.0 k/p
   ASTM C-857 "MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES"
   30% IMPACT FOR LESS THAN 3 FT. SOIL COVER
   120 pcf SOIL DENSITY
   40 pcf E.F.P. LATERAL SOIL PRESSURE ABOVE WATERTABLE
   80 pcf E.F.P. LATERAL SOIL PRESSURE BELOW WATERTABLE
   80 psf LIVE LOAD SURCHARGE
   TOP OF COVER MAXIMUM 3'-0" BELOW GRADE
   WATERTABLE 5'-0" BELOW GRADE FOR DESIGN OF WALLS

### GENERAL NOTES

1. CONTRACTOR TO – VERIFY ALL BLOCKOUT SIZES AND LOCATIONS
   DO ALL GROUTING & EPOXY OF VAULTS, HOLES AND SEAMS
   SUPPLY & INSTALL ALL PIPING & ELECTRICAL
   INSTALL ALL LADDERS
   DO ALL PAINTING
2. SEE U.V. Co. DWG CX-1062 FOR COVER REINFORCING DETAILS
3. SEE U.V. Co. DWG CX-1063 FOR BASE REINFORCING DETAILS
4. PRODUCTION QUANTITY: (1) ASSEMBLED VAULT

| LTR | REVISION | DATE | BY |
|---|---|---|---|

| PART | DESCRIPTION | QUAN. | SIZE | TOTAL WT. LBS. |
|---|---|---|---|---|

BILL OF MATERIAL

| ITEM | QUANTITY |
|---|---|
| SALES INFORMATION | |
| CUSTOMER GENERAL DYNAMICS | |

444 BASE & TOP

GENERAL DYNAMICS STANDARD

| | | | | |
|---|---|---|---|---|
| SALES SRB | S.O. / | SCALE 1"=1'-0" | APPROVED | DWG NO. CA-2752 |
| DRAWN MLF | DATE 01/29/01 | SHEET 1 OF 1 | WEIGHT | REV. |

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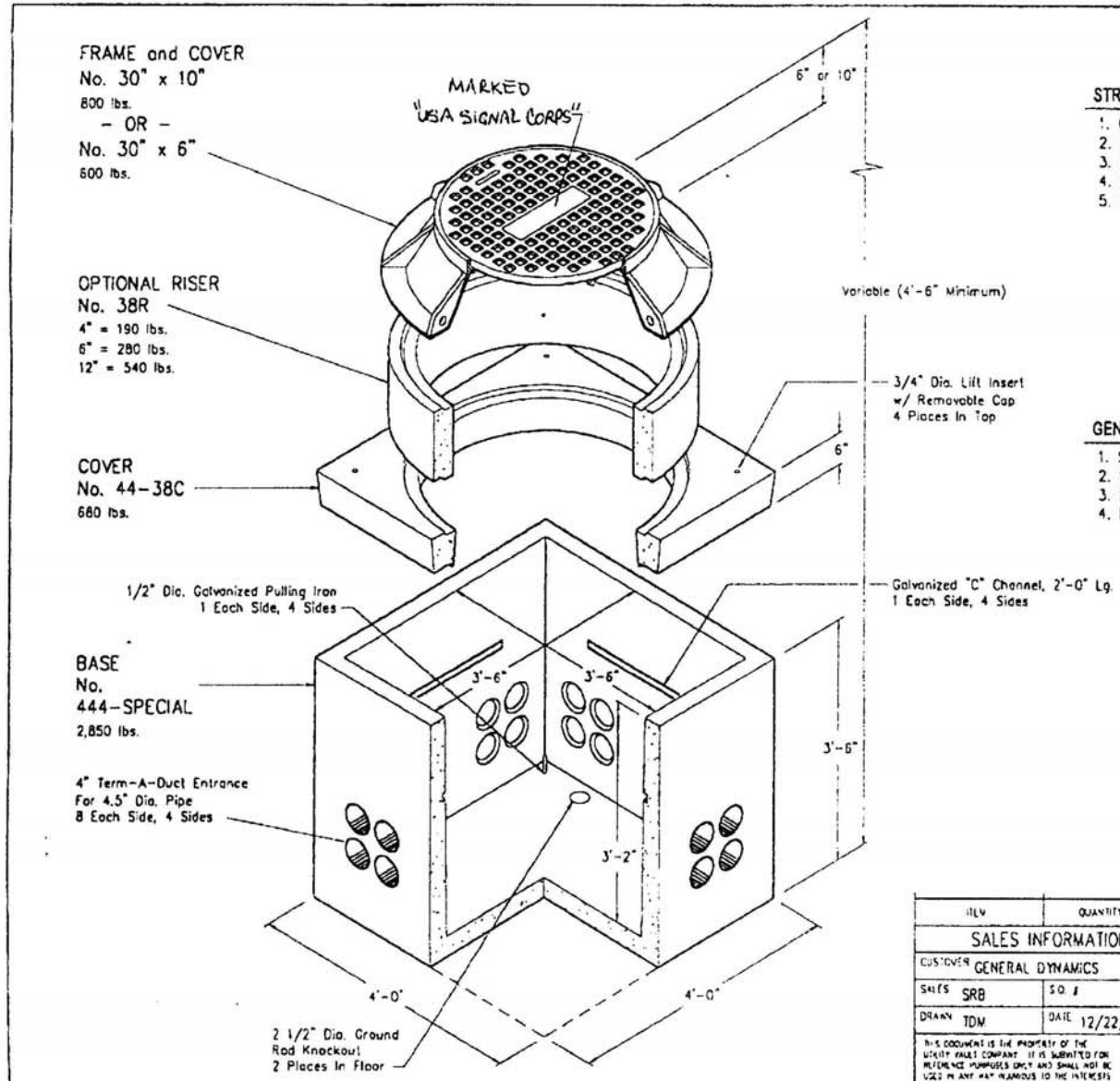
UTILITY VAULT COMPANY
P.O. Box 300 Auburn, WA 98071-0300
Auburn, WA / Wilsonville, OR / Riverside, CA / Chandler, AZ / Fontana, CA
Oldcastle Precast, Inc.




| LTR | REVISION | DATE | BY |
|---|---|---|---|
| A | STANDARD UPDATE | 01/31/01 | MLF |

## STRUCTURAL NOTES

1. CONCRETE - 28 DAY COMPRESSIVE STRENGTH f'c = 4500 psi
2. REBAR - ASTM A-615 GRADE 60
3. MESH - ASTM A-185 GRADE 65
4. DESIGN - ACI-318-99 BUILDING CODE
5. LOADS - H-20 TRUCK WHEEL
   ASTM C-857 "MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES"
   30% IMPACT FOR LESS THAN 3 FT. SOIL COVER
   120 pcf SOIL DENSITY
   40 pcf E.F.P. LATERAL SOIL PRESSURE ABOVE WATERTABLE
   80 pcf E.F.P. LATERAL SOIL PRESSURE BELOW WATERTABLE
   80 psf LIVE LOAD SURCHARGE
   TOP OF COVER MAXIMUM 5'-0" BELOW GRADE
   WATERTABLE 5'-0" BELOW GRADE FOR DESIGN OF WALLS

## GENERAL NOTES

1. SEE U.V. Co. DWG CA-2752 FOR LAYOUT DETAILS
2. SEE U.V. Co. DWG CK-1052 FOR COVER REINFORCING DETAILS
3. SEE U.V. Co. DWG CK-1053 FOR BASE REINFORCING DETAILS
4. PRODUCTION QUANTITY: (1) ASSEMBLED VAULT

| PART | DESCRIPTION | QUAN. | SIZE | TOTAL WT. LBS. |
|---|---|---|---|---|

BILL OF MATERIAL

444 w/4.5"ø TERM-A-DUCTS

GENERAL DYNAMICS STANDARD

| MLV | QUANTITY |
|---|---|
| SALES INFORMATION | |
| CUSTOMER GENERAL DYNAMICS | |
| SALES SRB | S.O. # |
| DRAWN TDM | DATE 12/22/00 |

| | | | |
|---|---|---|---|
| SCALE NONE | APPROVED | DWG NO. BA-1162 | REV. A |
| SHEET 1 OF 1 | WEIGHT | | |

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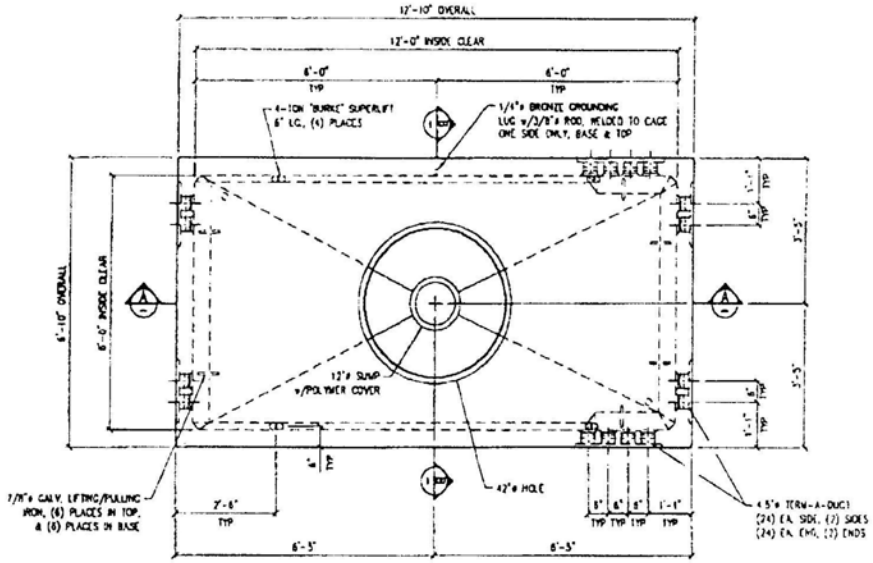
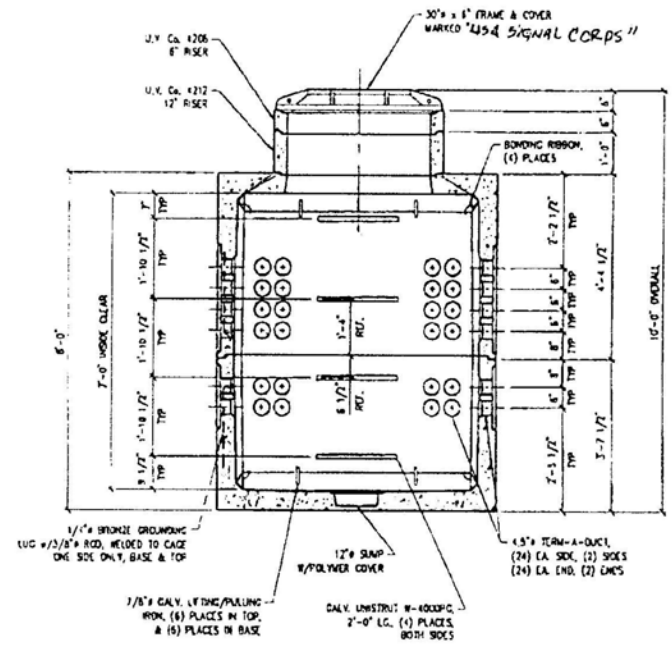
UTILITY VAULT COMPANY
P.O. Box 588 Auburn, WA 98071-0588
Auburn, WA / Wilsonville, OR / Pleasanton, CA / Chandler, AZ / Fontana, CA
Oldcastle Precast, Inc.

1/27/03

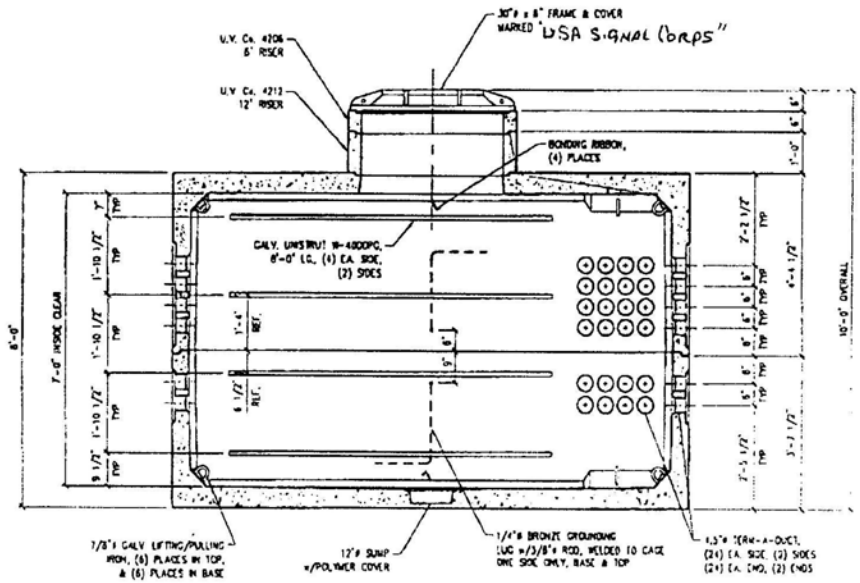
| LTR | REVISION | DATE | BY |
|---|---|---|---|
| A | MOVED LOWER GROUND INSERT DOWN | 07/20/01 | SRB |




## PLAN VIEW




## SECTION




## SECTION

**SHIPPING WEIGHTS:**

| | |
|---|---|
| BASE = | 13,800 lbs. |
| TOP = | 14,600 lbs. |
| 8" RISER = | 350 lbs. |
| 12" RISER = | 650 lbs. |
| COVER = | 600 lbs. |
| TOTAL = | 30,000 lbs. |

**LIFTING INSERTS:**

BASE = (4) 7/8"ø GALV. LIFTING/PULLING IRON
TOP = (4) 4-TON "BURKE" SUPERLIFT
RISERS = (1) 3/4"ø FERRULE LOOP

**STRUCTURAL NOTES:**

1. CONCRETE - 28 DAY COMPRESSIVE STRENGTH f'c = 4500psi
2. REBAR - ASTM A-615 GRADE 60
3. MESH - ASTM A-185 GRADE 85
4. DESIGN - ACI-318-95 BUILDING CODE
   ASTM C-857 "MINIMUM STRUCTURAL DESIGN LOADING FOR UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES"
5. LOADS - H-20 TRUCK WHEEL w/ 30% IMPACT PER AASHTO
   120 pcf SOIL DENSITY
   40 pcf EQUIVALENT FLUID PRESSURE ABOVE WATER TABLE
   60 pcf EQUIVALENT FLUID PRESSURE BELOW WATER TABLE
   WATER TABLE AT 5'-0" BELOW GRADE FOR DESIGN
   5'-0" MAX. SOIL COVER

**GENERAL NOTES:**

1. CONTRACTOR TO - VERIFY ALL BLOCKOUT SIZES AND LOCATIONS
   VERIFY ALL DIMENSIONS
   DO ALL GROUTING REQUIRED
   SUPPLY & INSTALL ALL PIPING & ELECTRICAL
   INSTALL ALL LADDERS
2. SEE DRAWING /OCKSTD0124 FOR STEEL REINFORCING DETAILS

| PART | DESCRIPTION | QUAN. | SIZE | TOTAL WT. LBS. |
|---|---|---|---|---|

BILL OF MATERIAL

| ITEM | QUANTITY |
|---|---|
| SALES INFORMATION | |
| CUSTOMER | |
| SALES SRB | S.O. # |
| DRAWN VF | LINE # |
| CHECKED | DATE 12/08/99 |

38Y-612-TA w/42"ø ACCESS & 4.5"ø TERM-A-DUCTS
COMMUNICATION VAULT
STANDARD VAULT

SCALE 1/2"=1'-0" | APPROVED | DWG NO. CB-0436 | REV. A
SHEET 1 OF 2 | WEIGHT 30,000 lbs.

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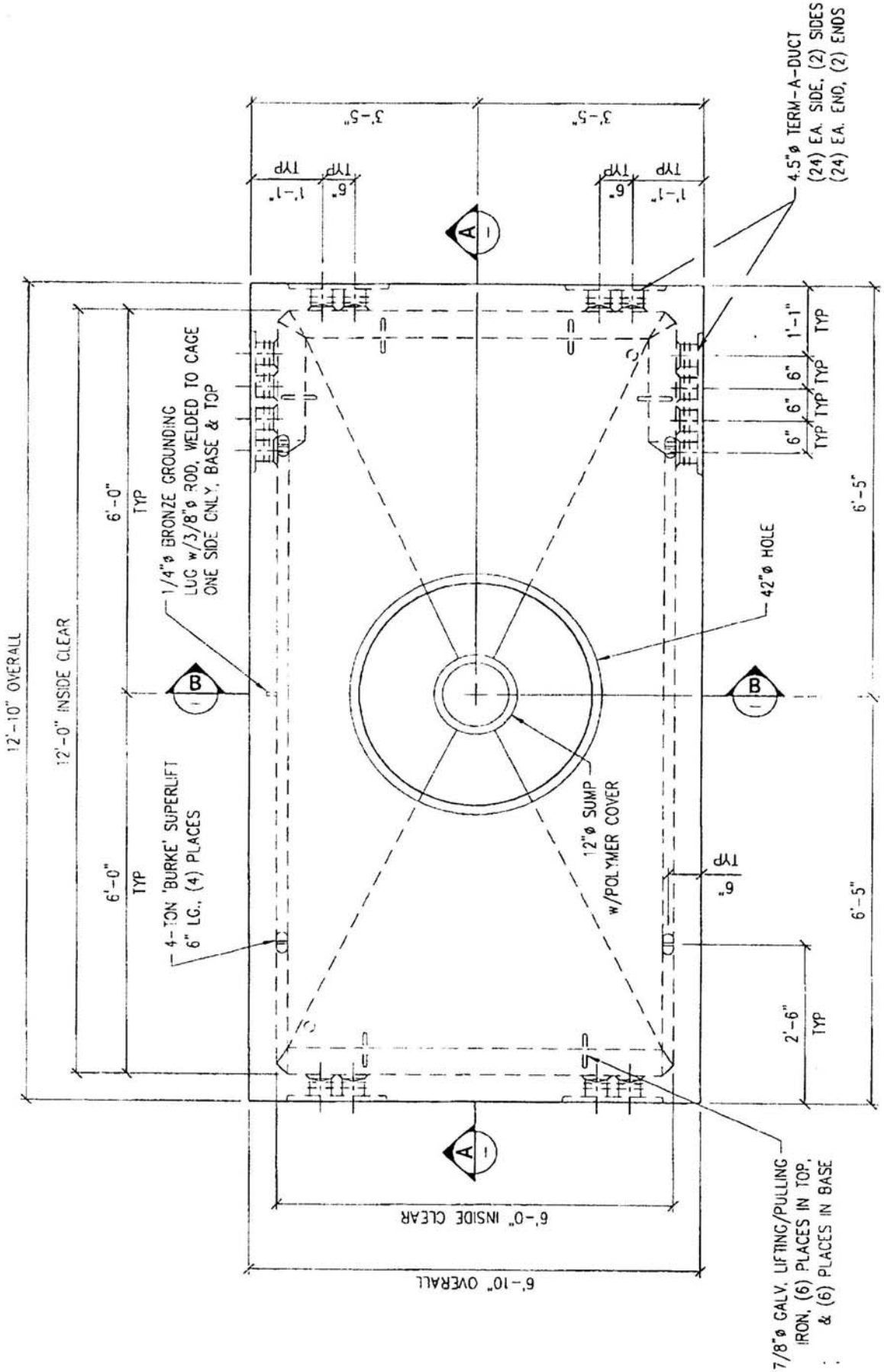
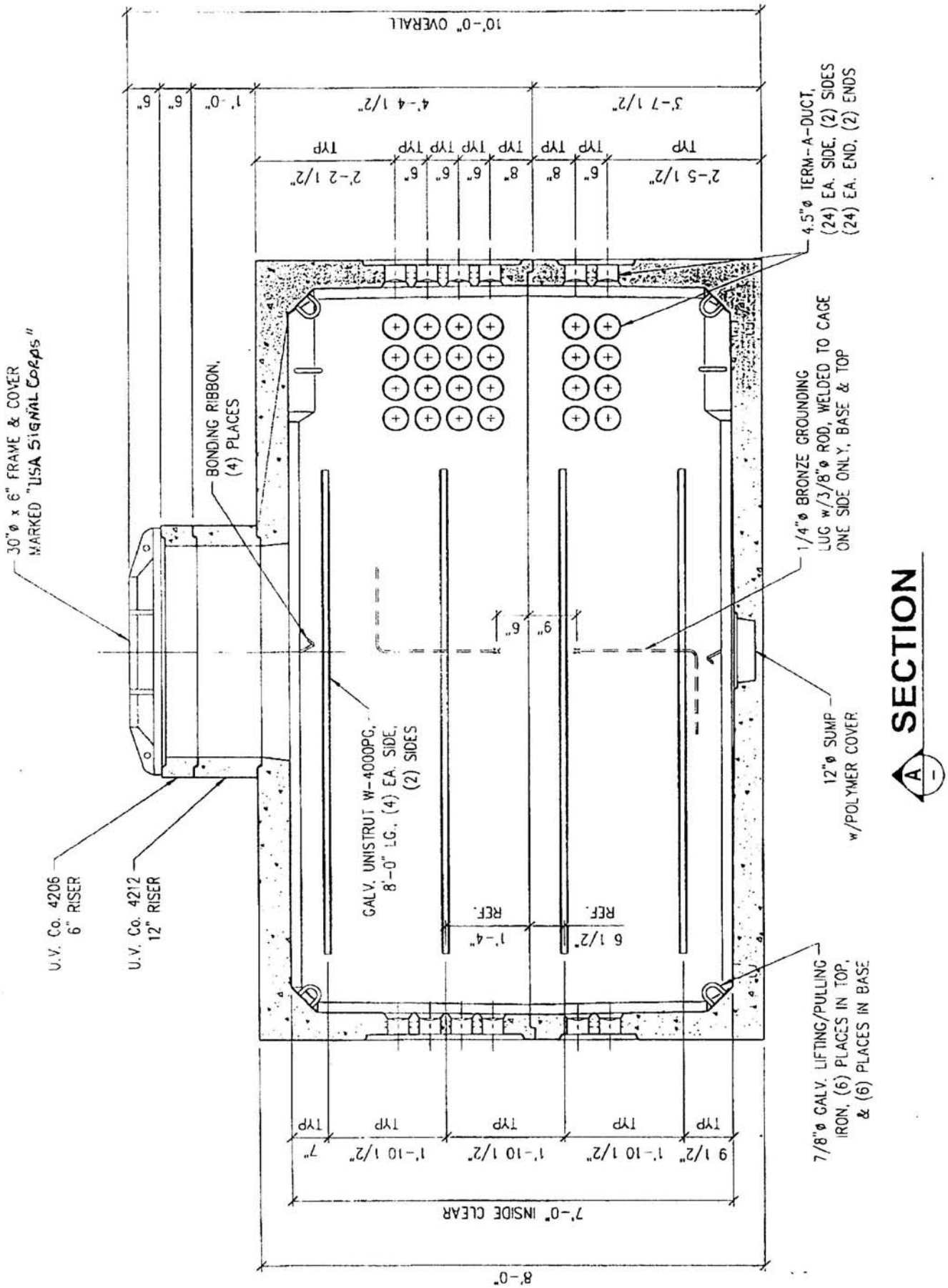
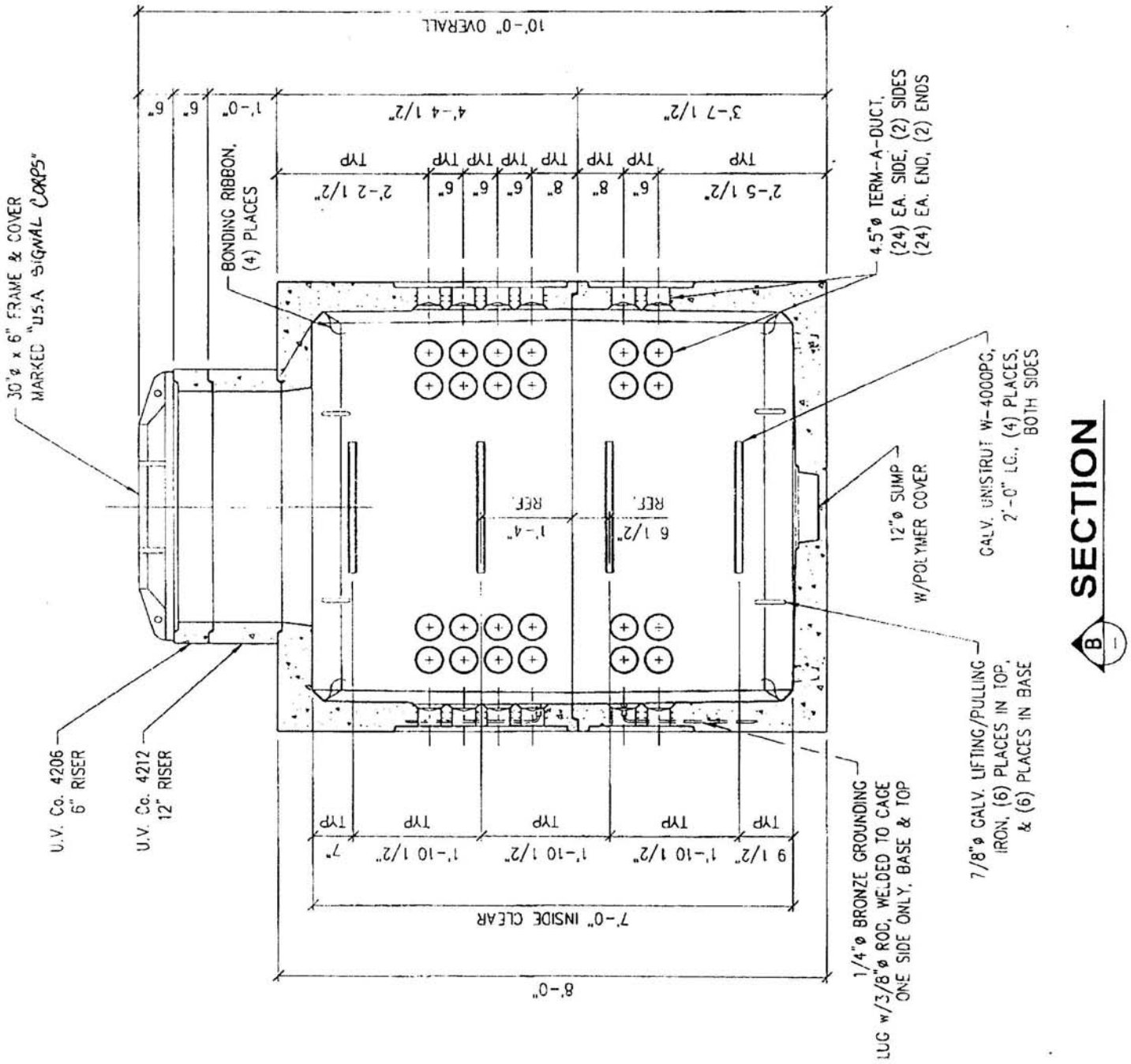

4.5"ø TERM-A-DUCT
(24) EA. SIDE, (2) SIDES
(24) EA. END, (2) ENDS
3'-5"
3'-5"
1'-1" TYP
6" TYP
1'-1" TYP
6" TYP
A
1/4"ø BRONZE GROUNDING
LUG w/3/8"ø ROD, WELDED TO CAGE
ONE SIDE ONLY, BASE & TOP
6'-0" TYP
12'-10" OVERALL
12'-0" INSIDE CLEAR
B
42"ø HOLE
12"ø SUMP
w/POLYMER COVER
4-TON 'BURKE' SUPERLIFT
6" LG., (4) PLACES
6'-0" TYP
6" TYP
2'-6" TYP
6'-5"
6'-5"
6'-0" INSIDE CLEAR
6'-10" OVERALL
7/8"ø GALV. LIFTING/PULLING
IRON, (6) PLACES IN TOP,
& (6) PLACES IN BASE

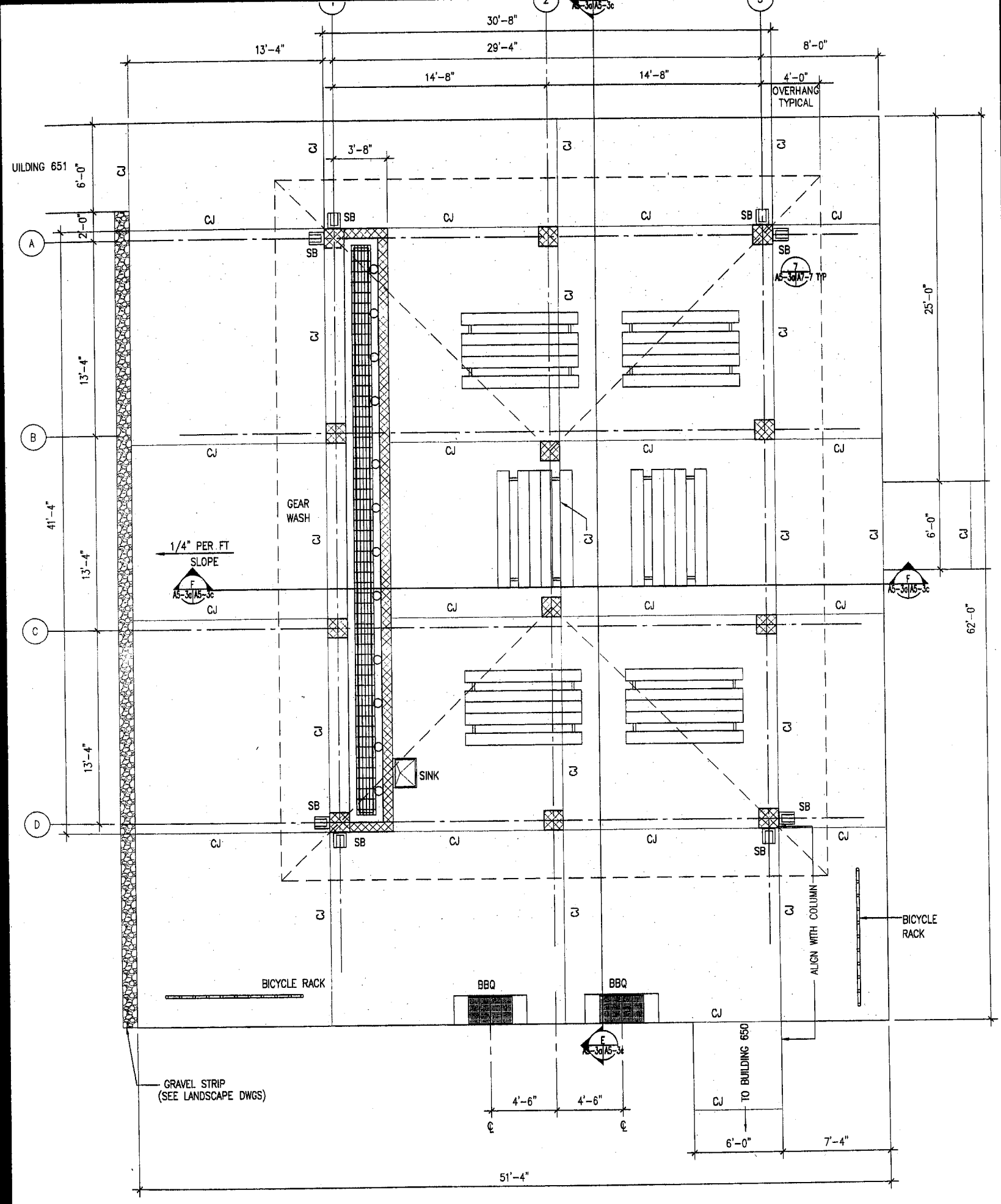
# PLAN VIEW


10'-0" OVERALL
6"
6"
1'-0"
4'-4 1/2"
3'-7 1/2"
TYP
2'-2 1/2"
2'-5 1/2"
4.5"ø TERM-A-DUCT, (24) EA. SIDE, (2) SIDES (24) EA. END, (2) ENDS
30"ø x 6" FRAME & COVER MARKED "USA SIGNAL CORPS"
BONDING RIBBON, (4) PLACES
1/4"ø BRONZE GROUNDING LUG w/3/8"ø ROD, WELDED TO CAGE ONE SIDE ONLY, BASE & TOP
9"
6"
GALV. UNISTRUT W-4000PG, 8'-0" LG., (4) EA. SIDE, (2) SIDES
12"ø SUMP w/POLYMER COVER
U.V. Co. 4206 6" RISER
U.V. Co. 4212 12" RISER
1'-4"
REF.
6 1/2"
7/8"ø GALV. LIFTING/PULLING IRON, (6) PLACES IN TOP, & (6) PLACES IN BASE
7"
1'-10 1/2"
9 1/2"
7'-0" INSIDE CLEAR
8'-0"
SECTION
A


10'-0" OVERALL
6"
6"
1'-0"
4'-4 1/2"
3'-7 1/2"
TYP
TYP TYP TYP TYP TYP
TYP
2'-2 1/2"
6" 6" 6" 8" 8" 6"
2'-5 1/2"
30"ø x 6" FRAME & COVER
MARKED "U.S.A. SIGNAL CORPS"
BONDING RIBBON,
(4) PLACES
4.5"ø TERM-A-DUCT,
(24) EA. SIDE, (2) SIDES
(24) EA. END, (2) ENDS
REF.
REF.
1'-4"
6 1/2"
GALV. UNISTRUT W-4000PG,
2'-0" LG., (4) PLACES,
BOTH SIDES
12"ø SUMP
W/POLYMER COVER
U.V. Co. 4206
6" RISER
U.V. Co. 4212
12" RISER
TYP
TYP
TYP
TYP
TYP
7"
1'-10 1/2"
1'-10 1/2"
1'-10 1/2"
9 1/2"
7'-0" INSIDE CLEAR
8'-0"
1/4"ø BRONZE GROUNDING
LUG w/3/8"ø ROD, WELDED TO CAGE
ONE SIDE ONLY, BASE & TOP
7/8"ø GALV. LIFTING/PULLING
IRON, (6) PLACES IN TOP,
& (6) PLACES IN BASE
SECTION
B
1

ATTACHMENT 25

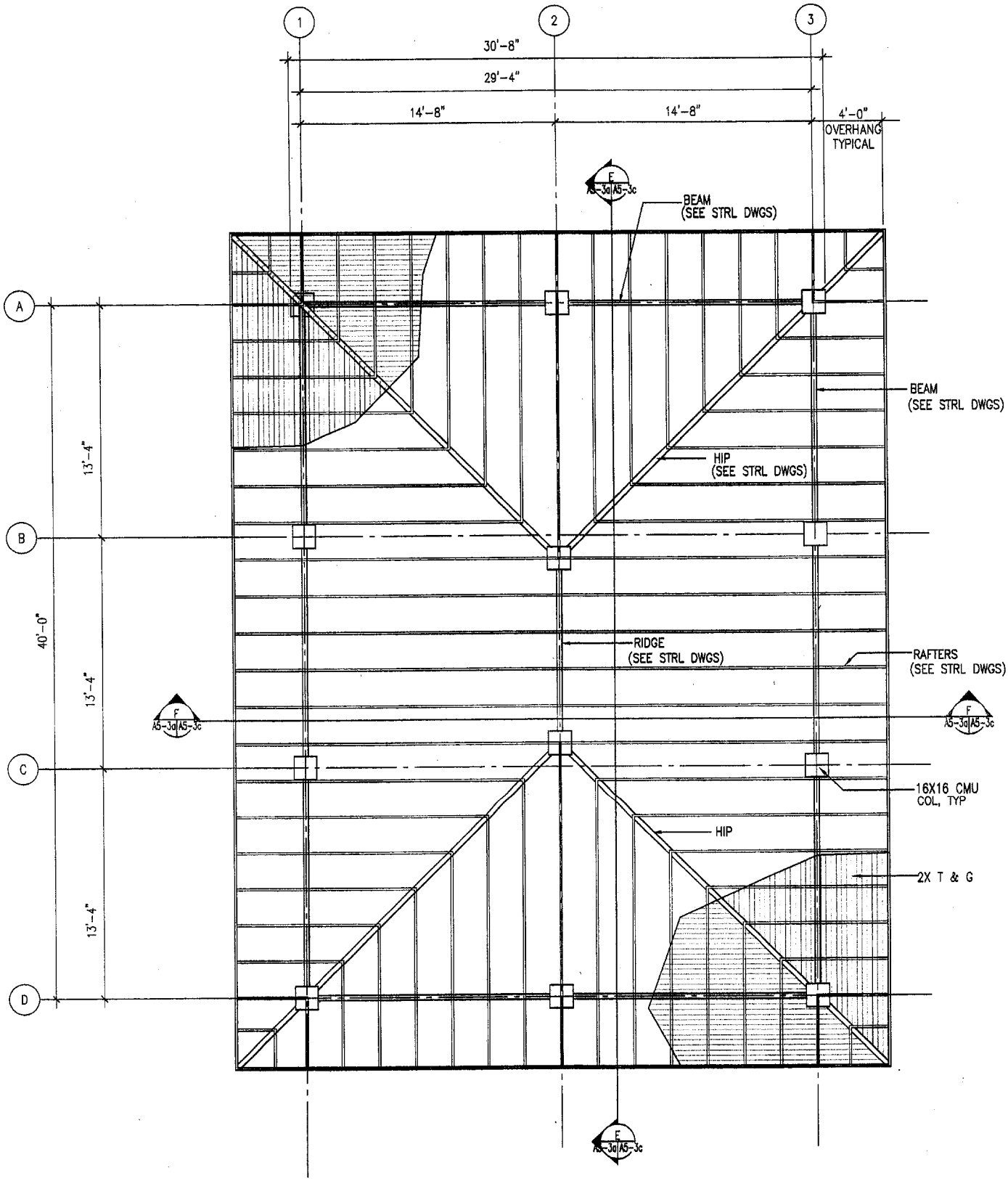
GEAR WASH/RECREATION BUILDING




# GEAR WASH / RECREATION BUILDING FLOOR PLAN (A)

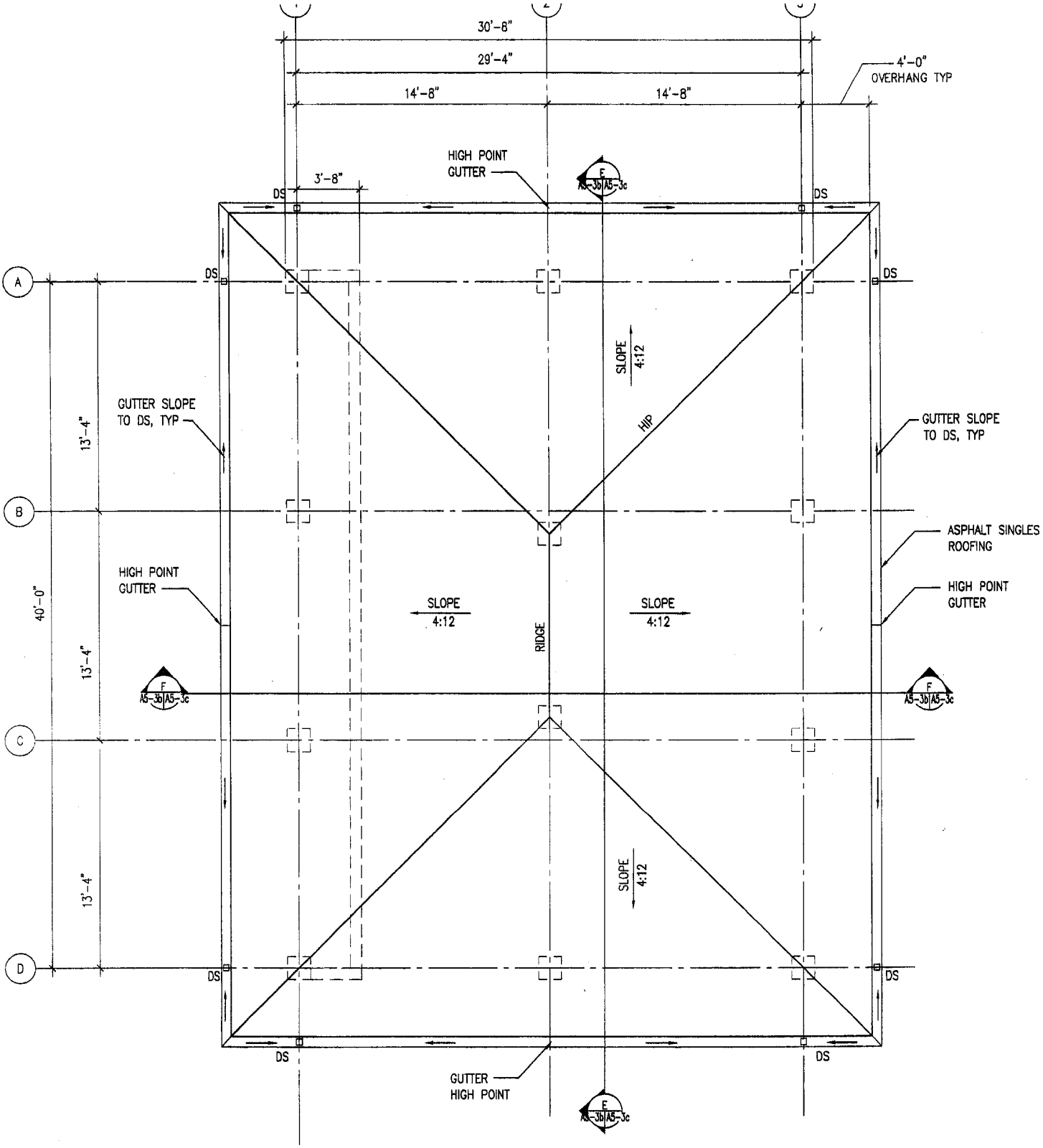
SCALE: 1/4" = 1'-0"

A5-3a|A5-3a



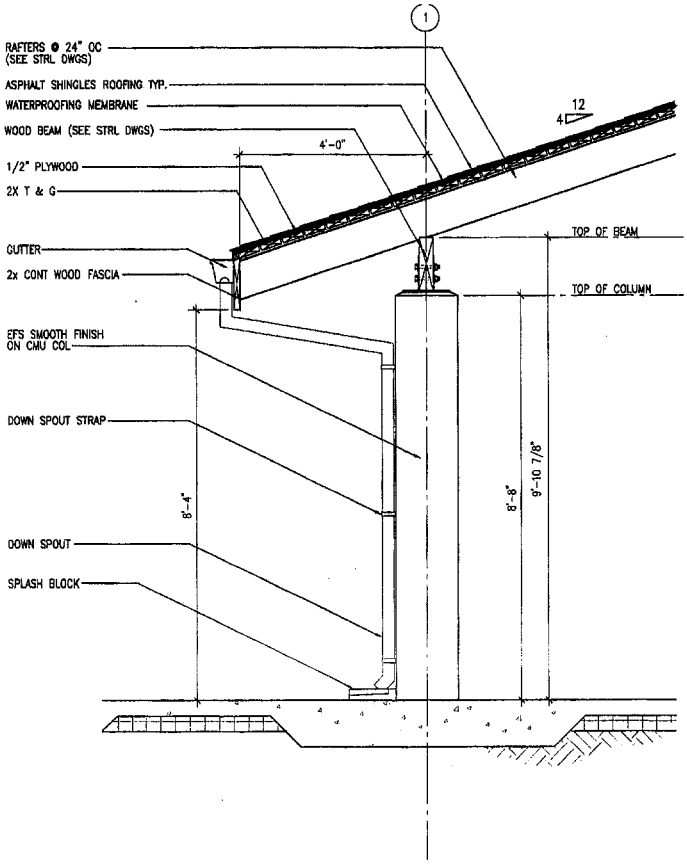

GEARWASH/ RECREATION BUILDING
REFLECTED CEILING PLAN
SCALE: 1/4" = 1'-0"

B
A5-3a A5-3a

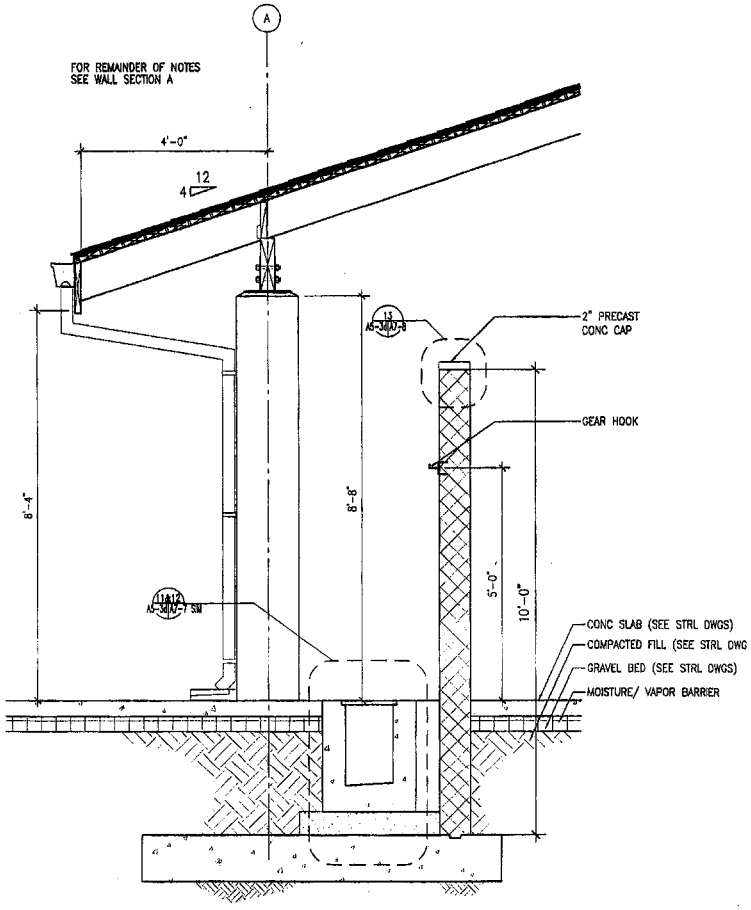



ROOF PLAN
SCALE: 1/4" = 1'-0"

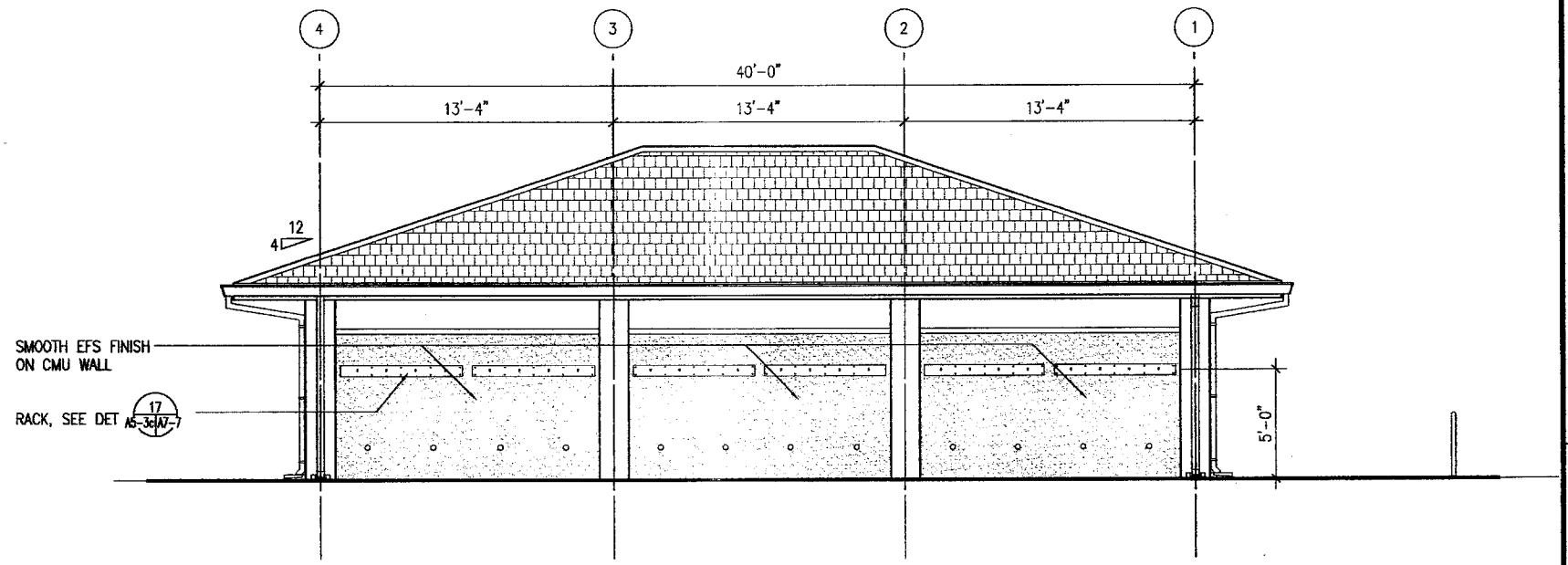
A
A5-3b|A5-3c




WALL SECTION (A)
SCALE: 3/4" = 1'-0"
A5-3d | A5-3c

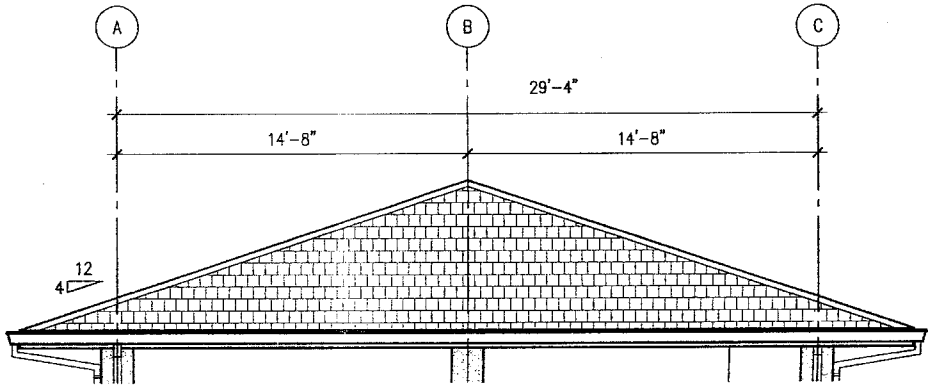



WALL SECTION (B)
SCALE: 3/4" = 1'-0"
A5-3d | A5-3c




NORTHWEST ELEVATION B A5-3c A5-3c

SCALE: 1/4" = 1'-0"



ATTACHMENT 26

PRELIMINARY SOILS REPORT

# PRELIMINARY
## GEOTECHNICAL INVESTIGATION REPORT
## for
## FY03 MCA PN 52068 & BUP 52069.
## WBR, Brigade Complex, Phase 3A, Quad C
## Schofield Barracks, HI

**March 2003**

**1.0 PURPOSE AND SCOPE:** The primary purpose of this preliminary soils investigation report is to provide information concerning soils design for the project to potential bidders. This report will include recommendations regarding area grading, subgrade preparation, foundation design, and flexible pavement overlay design. A final soils report including investigations will be performed by the successful bidder and may revise or supercede information/recommendations included in this report. Data for this report was obtained from previous projects in the vicinity.

**2.0 GEOLOGIC DATA:**

**2.1 References:** "Geology of the State of Hawaii", Harold T. Stearns, 2nd edition, 1985, pages 59 and 115-116.

**2.2 Geology:** Schofield Barracks is located on the Schofield Plateau between the Waianae and Koolau Ranges. The Schofield Plateaus was formed by lava flows from the Koolau range stopping against the older Waianae range. Alluvium from the Waianae range also butts against and interfingers with the Koolau lavas on the western side of the plateau and along the rim of Kaukonahu Valley. The project area is generally underlain by thick deposits (approximately 50 to 60 feet) of fluvial and residual soils. The basalts in Hawaii slowly decompose by physical and chemical weathering into the red soils observed in road cuts. The weathering decreases with increasing depth below the ground surface. Near surface soil have been completely altered such that the soil has no characteristics of the original rock. Along deep road cuts along Kamehameha Highway near Schofield Barracks, Sterns (ref. 2.1.a.) observed approximately 10 feet of red soil overlying about 50 to 60 feet of decomposed basal in which the physical features of the parent basalt can still be observed.

Scattered boulders encountered within excavations are the result of the decomposition of basalt into "onion skin" boulders or spheroidally weathered basalt. Larger quantities of

basalt boulders and cobbles, if encountered, may be the fluvial deposits from the Waianae range.

**3.0 SUBSURFACE CONDITIONS.** Previous borings indicate the site is generally underlain by reddish brown with occasional tan and grayish-brown clayey silts (MH). These residual soils range in consistency from stiff to hard. Previous experience indicates occasional boulders will most likely be encountered within deeper excavations during construction. No groundwater was encountered to the maximum depth drilled.

**4.0 FOUNDATION DESIGN:**

**4.1 References.**

a. Army Technical Manual TM 5-818-1, "Soils and Geology: Procedures for Foundation Design of Buildings and Other Structures," October 1983.

**4.2 Discussion.** Based on the existing subsurface conditions, excavations can be accomplished using conventional earth moving equipment. A pneumatic hoe ram may be used to remove boulders that are larger than the utility trench width.

**4.3 Site Grading and Preparation.**

a. The ground surface where construction is proposed shall be completely cleared, stripped and grubbed to a depth sufficient to remove all pavements, slabs, appurtenances, vegetation, roots, and other debris. Grubbing and stripping should extend to a minimum depth of 6-inches. The stripped soils should be discarded or may be used as landscaping material with approval of the Contracting Officer. Surfaces to receive fill should be properly scarified, moisture conditioned to within 3% of optimum moisture and compacted to the specified density. Any soft areas that do not respond to the required compaction should be excavated to remove the soft material and backfilled with compacted satisfactory fill material.

b. All excavated in-situ residual soils free of deleterious matter and stones larger than 3 inches, may be used as satisfactory fill material. Excavated fill material should not be used as satisfactory fill material. **Imported** satisfactory fill material should consist of materials classified by ASTM D 2487 as GW, GP, GM, GC, SW, SP, SM, SC, ML, and MH. In addition, any imported material should have a liquid limit less than 60 and a plasticity index less than 30.

c. All fill materials (i.e., under building slabs or paved areas) should be moisture conditioned to within 3% of optimum moisture and compacted to a minimum 95% of

maximum density for cohesionless soils, and a minimum 90% of maximum density for cohesive soils, as determined by ASTM D 1557.

d. Satisfactory fill materials should be placed in 8-inch maximum loose lifts and compacted utilizing heavy compaction equipment. The loose lift thickness should be reduced to 6-inches when placed and compacted in confined areas, such as beneath or adjacent to footings, behind retaining walls or in utility trenches or when hand-tampers are used.

e. The finished grade from edge of building to 10 feet away should be sloped 5 percent to provide positive drainage away from foundations. If building roof runoff is intercepted with gutters and down spouts, the downspout should be long enough to discharge beyond the backfill limits of the buildings.

f. If footings are formed, the remaining annulus between the footing edge and excavation face should be wide enough to allow hand-held equipment to compact the backfill material. Excavation surfaces that become wet or muddy should be remediated by drying the excavation surface and recompacting or removing the wet material. Excavation surfaces that become dried out and cracked should be remediated by moisture conditioning and recompacting the surface.

**4.4 Shallow Foundations.** Based upon the N-values of the surface soils, the allowable bearing pressures for footings bearing on undisturbed clayey silt should be 2,500 psf. Allowable bearing pressures may be increased by one third for short term loading such as seismic or wind loads. The allowable bearing pressure may change based upon the results of the final soils report preparation. All footings should bear a minimum 18 inches below the lowest adjacent grade. Isolated and continuous footings should be at least 24-inches wide.

## 5.0 FLEXIBLE PAVEMENT OVERLAY DESIGN:

### 5.1 References.

A. Army Technical Manual TM 5-822-5, "Pavement Design for Roads, Streets, Walks, and Open Storage Areas", June 1992.

**5.2 Discussion.** For this preliminary soils report, the overlay will be assumed to be the same thickness as the removed material, 38 mm. The final design report will address anticipated vehicle traffic in its' overlay and pavement design.

### 5.3 Pavement Recommendations.

a. The asphalt concrete should meet State of Hawaii, Department of Transportation, Standard Specifications for Road and Bridge Construction, 1994; Mix No. IV; Aggregate absorption limited to maximum 5%; Asphalt cement PG 64-16 AASHTO MP 1. The asphalt pavement should be compacted to a minimum 91% of theoretical maximum density as determined by ASTM D 2041.

b. The base course should meet State of Hawaii, Department of Transportation, Standard Specifications for Road and Bridge Construction, 1994, 1-1/2 inch maximum size aggregate gradation. The base course should be compacted to 100% of maximum density as determined by ASTM D 1557.

c. The prime coat should meet ASTM D 2027 for MC-30 or MC-70 (cutback asphalt), and should be applied at a rate of 0.15 to 0.40 gallons per square yard. Prime coat should be placed on top of the compacted base course prior to placement of the surface course.

d. The tack coat should meet ASTM D 977 for SS-1 (emulsified asphalt), and should be applied at a rate of 0.05 to 0.20 gallons per square yard. Tack coat should be used to bond new asphalt pavement to any existing asphalt pavement or concrete structures (i.e., curb and gutters).

**6.0 POINT OF CONTACT**: For additional geotechnical design information or to discuss the recommendations in this report, please contact US Army Corps of Engineers, Pacific Ocean Division, Building 230, Fort Shafter, HI 96858, attention: Technical Support Branch, Raymond Kong (ph 808-438-6953).

ATTACHMENT 27

GTB DETAILS

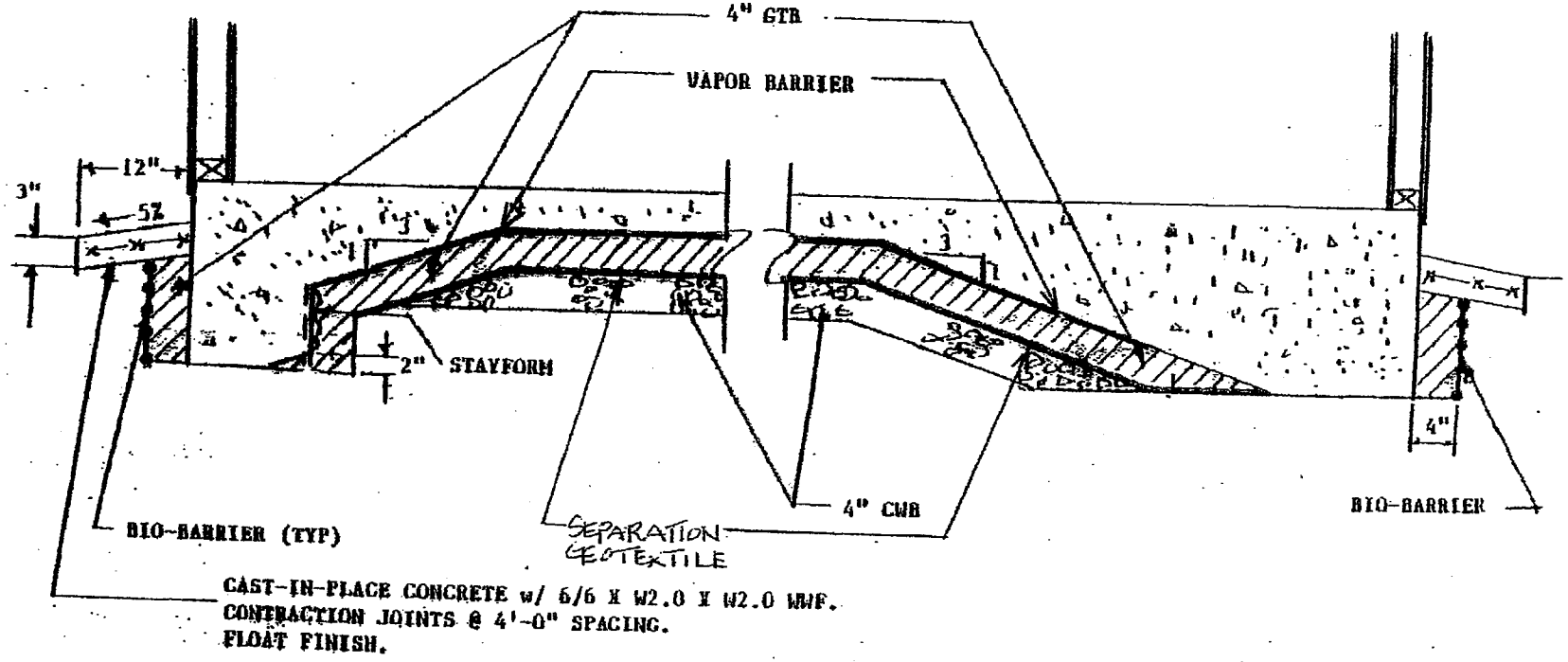



**FIGURE 1 - TYPICAL GTB DETAILS AT EXTERIOR FOOTINGS**
NOT TO SCALE

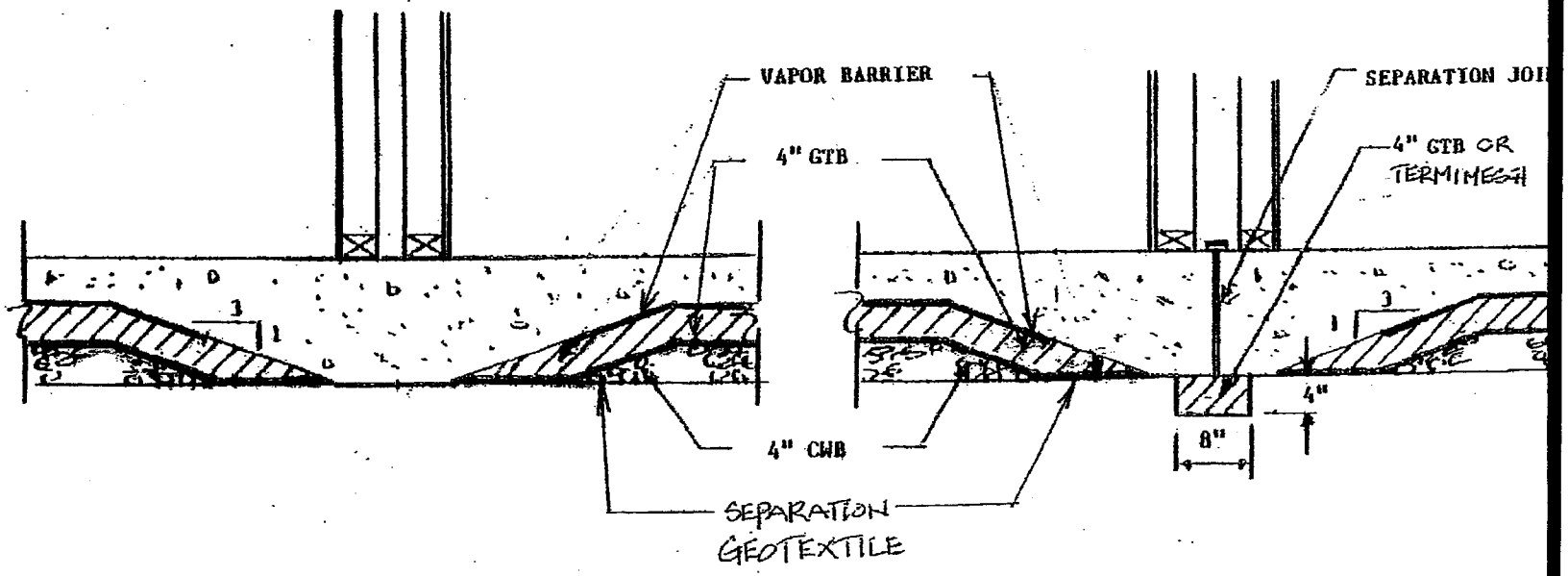



**FIGURE 2 - TYPICAL GTB DETAILS AT INTERIOR FOOTINGS**
**NOT TO SCALE**

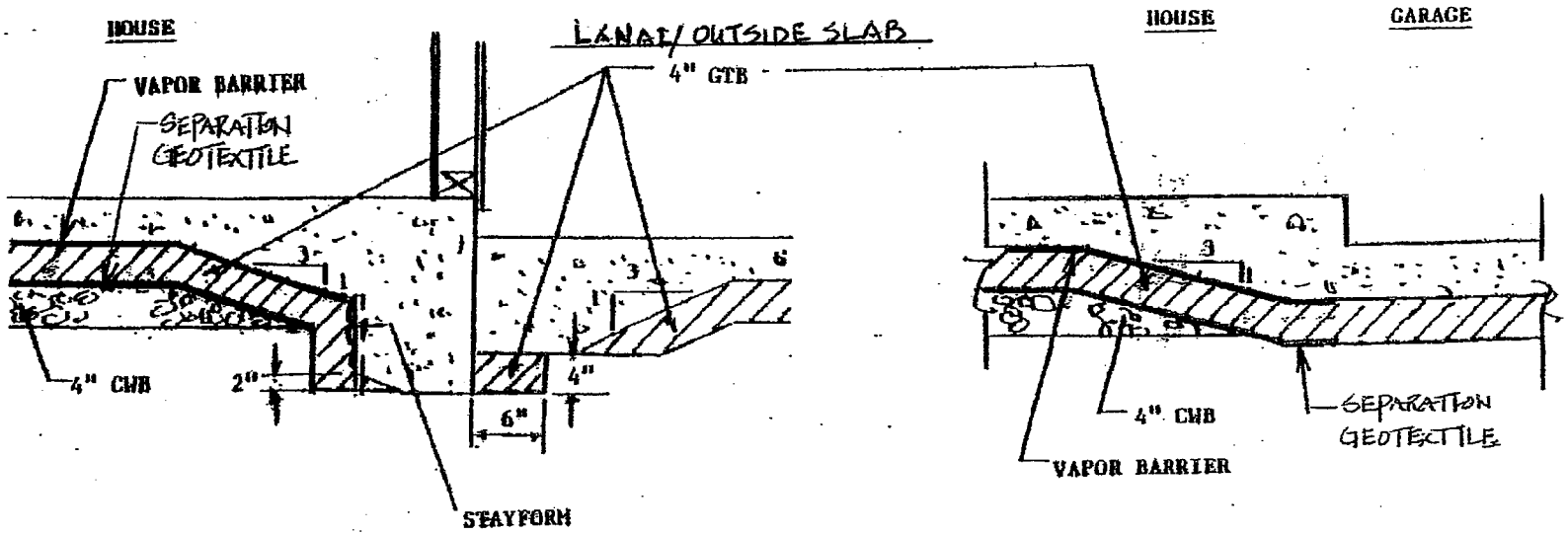



**FIGURE 3 - TYPICAL GTB DETAILS AT HOUSE TO GARAGE/PATIO INTERFACE**
**NOT TO SCALE**

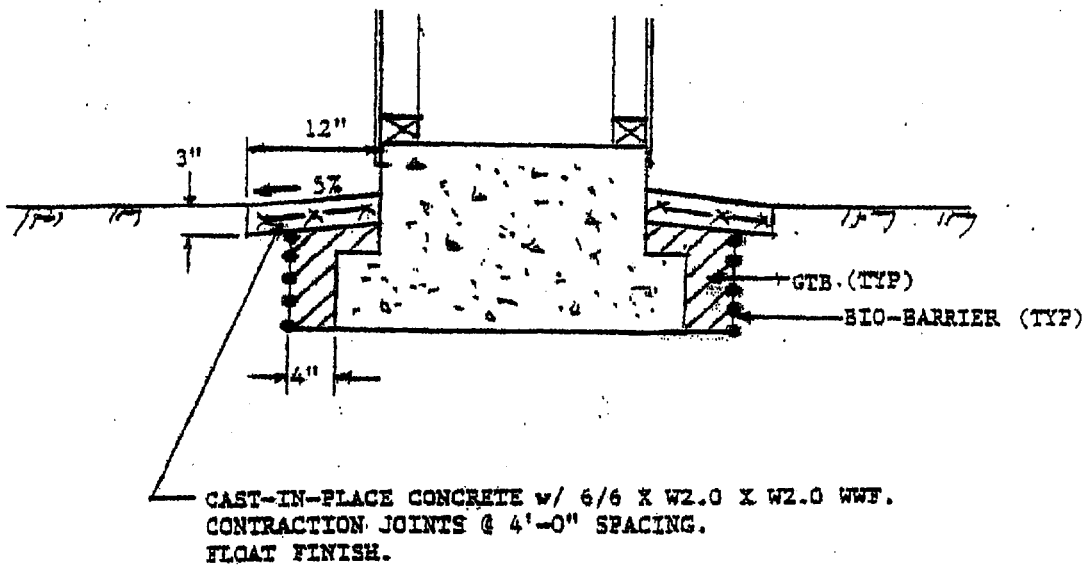



**FIGURE 5 - TYP. GTB DETAILS AT EXTERIOR COLUMN FOOTINGS**
**NOT TO SCALE**

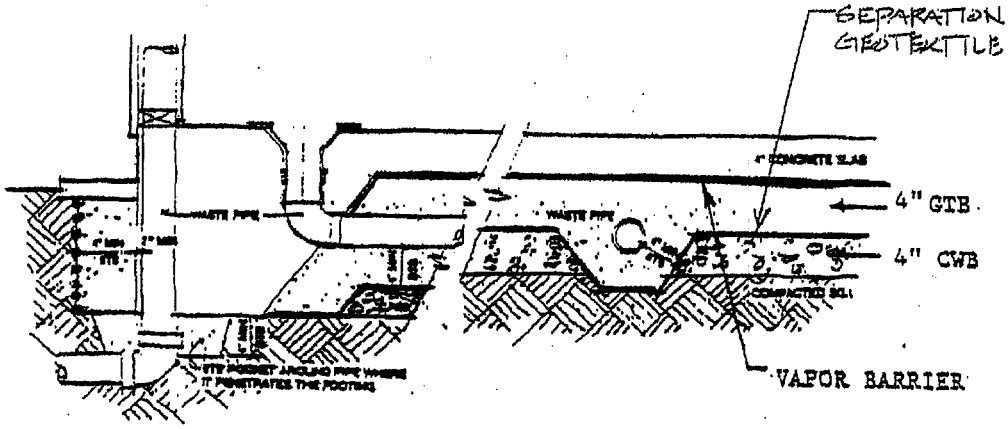



**FIGURE 6 - TYP. GTB DETAILS AT SUBSLAB DRAIN PIPING**
**NOT TO SCALE**

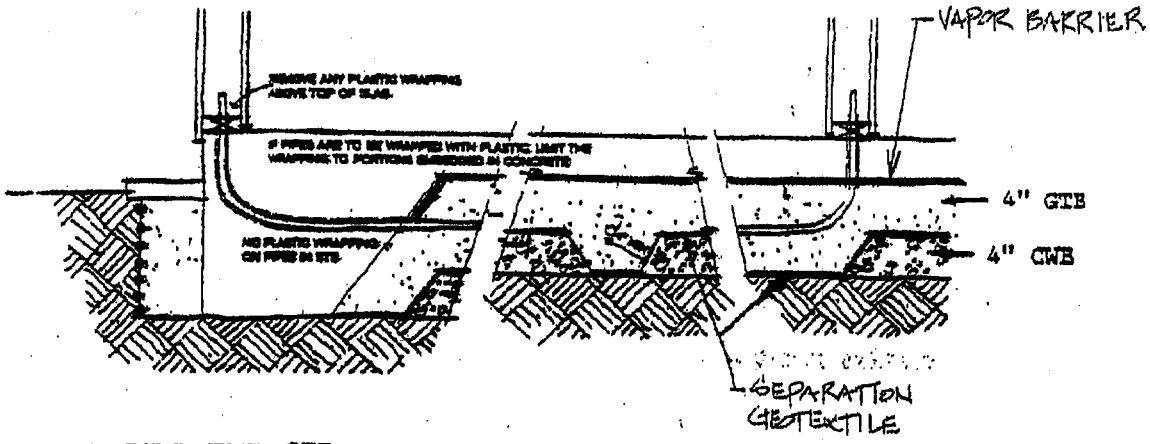



**FIGURE 7 - TYP. GTB DETAILS AT SUBSLAB CONDUITS/WATER PIPING**
**NOT TO SCALE**

SECTION 01012

# DESIGN AFTER AWARD

## 1.0 GENERAL

1.1 The Contractor shall propose a schedule for the number and composition of the design submittal phases. As a minimum, design submittals are required at the preliminary (50%), pre-final (90%) and final (100%). The requirements of each design stage are listed hereinafter. The Contractor shall reflect the number and schedules for the design submittals phases in the progress charts. As a maximum, the 50%, 90% and 100% shall be made into one consolidated package, which includes each of the fifteen (15) major categories listed in Paragraph, “Contents of Design Submittals,” except the foundation design, utilities under the slab (all utilities together as one submittal), the Building Interior Design, and long lead item submittals. These exceptions may be in addition to the 13 major submittals. More than one category may be combined in a submittal.

## 2.0 DESIGNER OF RECORD

The Contractor shall identify a Designer of Record ("DOR") for each area of design. All design disciplines shall be accounted for by listed, registered Designer(s) of Record. Each DOR shall be responsible for ensuring integrity of their design and design integration in all construction submittals and extensions to design developed by others, such as the constructor, subcontractors or suppliers. The DOR shall review and approve all construction submittals and extensions to design, in accordance with the procedures, described in Section 01330 SUBMITTALS. Each DOR shall be responsible for the responses to "Requests for Information" (RFI's), applicable to their area of design responsibility. Each DOR shall stamp, sign, and date all design drawings under their responsible discipline at each design submittal stage (see Contract clause - "REGISTRATION OF DESIGNERS") and all submittals under their responsible discipline, in accordance with the submittal review procedures. The DOR shall sign-off on all applicable RFI responses. "

## 3.0 DEFINITION OF DESIGN SUBMITTALS

3.1 **PRELIMINARY CONFORMANCE REVIEW SUBMITTAL (50%)**. The review of this submittal is primarily to insure that the contract documents and design analysis are proceeding in a timely manner and that the design criteria is being corrected interpreted. The submittal shall consist of the following:

1. Design Analysis, developed to 50%
2. 50% complete drawings
3. Outline Specifications
4. Environmental permits, as required. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect.

3.2 **SITE/UTILITY DESIGN SUBMITTALS**. These submittals are provided to allow the contractor to concentrate initial efforts for the site/utility portions of the project. This submittal shall consist of the following:

3.2.1 Pre-final Design Site/Utility Submittal (90%), hard copies.

3.2.1.1 Design analysis, developed to 90%, site work and utility work only.

3.2.1.2 90% complete site/utility drawings

3.2.1.3 Draft specifications on all items of work submitted for Pre-final review shall consist of legible marked-up specification sections.

3.2.2 Final Design Site/Utility Submittal, 1st Backcheck (100%). Hard copies and CADD drawings.

3.2.3 Final Design Site/Utility Submittal. 2nd Backcheck (a second backcheck submittal will be made if all of the comments were not satisfactorily resolved in the 1st Backcheck submittal as determined by the Contracting Officer). Note that additional backchecks will be required until all of the comments have been satisfactorily resolved.

3.2.3.1 Design Analysis, in final 100% complete form.

3.2.3.2 100% complete drawings.

3.2.3.3 Final typed specifications.

3.2.3.4 Environmental permits. When environmental permits are not required, the Contractor shall provide a statement with justification to that effect.

3.2.3.5 Pre-final Design Site/Utility (90%) Submittal review comments and responses.

3.2.3.6 Electronic Submission: All CADD files in native MicroStation Version 8 or latest format, as well as all prepared technical specifications shall be provided on CD-ROM. Two copies are required.

3.3 **PRE-FINAL BUILDING DESIGN SUBMITTAL (90%).** Hard copies and CADD drawings. The review of this submittal is to insure that the design is in accordance with directions provided the Contractor during the design process as well as the 50% submittal. The Contractor shall submit the following documents for Pre-final Design Review:

3.3.1 Design Analysis. The Design Analysis submitted for pre-final Design Review shall be in its final form. The Design Analysis shall include all backup material previously submitted and revised as necessary. All design calculations shall be included. The Design Analysis shall contain all explanatory material giving the design rationale for any design decisions, which would not be obvious to an engineer reviewing the Final Drawings and Specifications.

3.3.2 Drawings. The Contract Drawings submitted for pre-final Design Review shall include the drawings previously submitted which have been revised and completed as necessary. The Contractor is expected to have completed all of his coordination checks and have the drawings in a design complete condition. The drawings shall be complete at this time including the incorporation of any design review comments generated by the previous design review. The drawings shall contain all the details necessary to assure a clear understanding of the work throughout construction. Shop drawings will not be considered as design drawings. All design shall be shown on design drawings prior to submittal of shop drawings.

3.3.3 Specifications. The Draft Specifications on all items of work submitted for pre-final Design Review shall consist of legible marked-up specification sections.

3.3.4 Other Information. Site Utility design information need not be included in this submittal package except where interface to the interior building systems is required.

3.4 **FINAL BUILDING DESIGN SUBMITTAL 1ST BACKCHECK (100%)**. After the pre-final Design Review, the Contractor shall revise the Contract Documents by incorporating any comments generated during the pre-final Design Review and shall prepare final hard copy Contract Specifications. The Contractor shall submit the following documents for the design complete submittal:

3.4.1 Design Analysis. In final 100% complete form.

3.4.2 Drawings. In final, 100% complete drawings.

3.4.3 Specifications. In final, 100% complete specifications

3.4.4 Annotated Review Comments. Final review comments and responses.

3.4.5 Electronic Submission. All CADD files in native MicroStation Version 8 or latest format, as well as all prepared technical specifications shall be provided on CD-ROM. Two copies are required.

3.5 Final Design Site/Utility Submittal. 2nd Backcheck (a second backcheck submittal will be made if all of the comments were not satisfactorily resolved in the 1st Backcheck submittal as determined by the Contracting Officer). Note that additional backchecks will be required until all of the comments have been satisfactorily resolved.

3.6 **COMPREHENSIVE INTERIOR DESIGN**

3.6.1 Definition. The Comprehensive Interior Design (CID) shall involve the selection and sampling of all applied finishes including material, color, texture and patterns necessary to complete the building's interior architectural features. The CID shall meet all requirements addressed in SOW CH 14, Comprehensive Interior Design.

3.6.2 Samples. Present architectural finish samples in orderly arrangements according to like rooms/areas receiving like finish. Each like room receiving like finishes will be noted as a Color Scheme. Each Color Scheme shall have a written description of material used. This written description shall use the same material abbreviations and notes that appear on the Room Finish Schedule and Legend in the contract drawings. Present pre-wired workstation finishes on a color board separate from the architectural finishes. Submit the CID binders concurrently with the architectural design submittals.

3.6.3 Preliminary Submittals. The Contractor shall submit three complete sets of the initial CID package. The design philosophy shall use a warm neutral background color with appropriate accent colors. All CID proposals shall be reviewed and approved by the Government. The Interior Designer shall revise the CID binders after each review and update the CID to satisfy review comments. Each submittal will follow this method of review until the Government approves the completed CID package.

3.6.4 Government Approval. Government approval will be sought from the Honolulu Engineer District, which is the District Authority Having Jurisdiction (DAHJ). The DAHJ will be consulted for all interpretations of Comprehensive Interior Design (CID) to be used in this project through the Contracting Officer. The Contractor shall direct all questions, interpretations and clarifications to the Contracting Officer. All requests for information by the Contractor shall be submitted to the Contracting Officer in writing with the appropriate sketches, basis for waiver, specific question and any other information deemed necessary by the DAHJ. In general, a minimum of seven (7) calendar days is required by the DAHJ to respond to all inquiries. The seven days will start from the day of receipt by the Contracting Officer. In the event interpretation or approval is required from HQUSACE, an additional seven (7) calendar days will normally be required.

3.6.5 Final Submittal. After approval of the Preliminary Submittal, the Contractor shall submit three (3) complete sets of the approved and final Comprehensive Interior Design package. Once the Contractor has submitted the CID and the Government has approved the submittal, all materials, finishes, colors, textures and pattern submitted and approved for this project are then considered as part of the contract and the Contractor shall furnish all approved CID finishes. No deviations will be considered.

3.6.6 Format. Submit all CID information and samples on 8 1/2"x 11" modules. Place the project title, base, architectural firm, page number and date on the bottom of each page or module.

3.6.6.1 The module shall support and anchor all samples. Anchor large or heavy samples with mechanical fasteners, Velcro, double-sided foam tape or contact cement. Rubber cement or glue will not be acceptable.

3.6.6.2 Assemble the 8 1/2" x 11" pages and modules in a 3" D-ring binder. Holes for placement of the modules in the binder shall be 3/8" in diameter. Each binder shall be identified on the outside spine and front cover by title, project number, percentage phase and date.

3.6.6.3 Material and finish samples shall indicate true pattern, color and texture.

3.6.6.4 Where paint manufacturers color names and numbers are used indicated the finish of the paint such as gloss, semi-gloss, flat and so on.

3.6.6.5 Signage may include emblems, striping, letters, numbers and logos. The interior designer shall consider visual appearance, organization, location, structural supports (if required) and relation to other base graphics. Indicate on a separate signage sheet the location and message for all signage. Submit a sample of the signage material finish and color with the structural finishes.

3.6.6.6 No photographs or colored photocopies of materials will be accepted or approved.

3.6.7 CID Binder. The CID Binder shall include the following information at each design submittal in this order:

==========

**SEQUENCE OF CID SUBMITTAL**

1. Title page

2. Table of contents

3. Design objectives - A statement of design objectives explaining the interior design philosophy of the facility shall be provided in the CID. Design objectives and the proposed method of accomplishing the objectives. Shall cover, when applicable, energy efficiency, safety, health, maintenance, image, personal performance of occupants and functional flexibility.

4. Interior floor plan

5. Interior sample finish boards

   Scheme A
   Scheme B
   Scheme C

Example all restrooms could be noted as color scheme "A", all general open office finishes could be noted as color scheme "B" and the main lobby could be noted as color scheme "C".

6. Room finish schedule

7. Signage

8. Signage plan

9. Pre-wired workstation composite floor plans

10. Pre-wired workstation typical - elevations and component inventory.

11. Pre-wired workstation panel identification plan with electrical outlet placement including base feed.

12. Plan must show suitability of proposed space to suit the furniture to be provided.

==========

4.0 QUANTITY OF DESIGN SUBMITTALS

4.1 General. The documents, which the Contractor shall submit to the Government for each submittal, are listed and generally described hereinafter.

DISTRIBUTION

| Activity and Address | Drawing Size <Full> | Drawing Size <Half> | Color Boards** |
|---|---|---|---|
| U.S. Army Corp. of Engineers<br>Honolulu Engineering District<br>Bldg. 230, Room 318<br>Ft. Shafter, HI 96858<br>Attn: CEPOH-PP-A / Kenneth Cabalce | 14 | 2 | 2 |
| Director of Public Works<br>U.S. Army Garrison, Hawaii<br>Attn: Michael Kumabe<br>WAAF, Schofield Barracks, HI 96857-5013 | 5 | | 1 |
| 3rd Brigade Commander<br>Address ?<br>Schofield Barracks, HI | 2 | | 1 |
| | | | |

** Color boards shall be submitted with the 100% building submittal only.

5.0 MAILING OF DESIGN SUBMITTALS

5.1 General. Mail all design submittals to the Government during design and construction, using an overnight mailing service. The Government will furnish the Contractor addresses where each copy shall be mailed to after award of the contract. The submittals shall be mailed to the addresses listed in para. 4.1 Distribution.

5.2 Transmittal Letter. Each design submittal shall have a transmittal letter accompanying it indicating the date, design percentage, type of submittal, list of items submitted, transmittal number and point of contact with telephone number.

6.0 COORDINATION

6.1 Written Records. The Contractor shall prepare a written record of each design site visit, meeting, or conference, either telephonic or personal, and furnish within five (5) working days copies to the Contracting Officer and all parties involved. The written record shall include subject, names of participants, outline of discussion, and recommendation or conclusions. Number each written record for the particular project under design in consecutive order.

6.2 Design Needs List. Throughout the life of his contract the Contractor shall furnish the COR a monthly "needs" list for design related items. This list shall itemize in an orderly fashion design data required by the Contractor to advance the design in a timely manner. Each list shall include a

sequence number, description of action item, name of the individual or agency responsible for satisfying the action item and remarks. The list will be maintained on a continuous basis with satisfied action items checked off and new action items added as required. Once a request for information is initiated, that item shall remain on the list until the requested information has been furnished or otherwise resolved. Copies of the list will be mailed to both the Administrative Contracting Officer and the agencies tasked with supplying the information.

7.0 GOVERNMENT REVIEW

7.1 Design Schedule. Within 30 days **after Notice** to Proceed, the Contractor shall submit, for approval, a complete design schedule with all submittals and review times indicated in calendar dates. The Contractor shall update this schedule monthly. No design submittals will be reviewed or evaluated until after receipt and acceptance of the proposed design/review schedule.

7.2 Government Review Period. After receipt, the Government will be allowed thirty (30) calendar days to review and comment on each design submittal. For each design review submittal, the Administrative Contracting Officer (ACO) will furnish, to the Contractor, a single consolidated listing of all comments from the various reviewers and from others concerned agencies involved in the review process. The review will be for conformance with the technical requirements of the solicitation and the Successful Offeror's (Contractor's) RFP proposal. If the Contractor disagrees technically with any comment or comments and does not intend to comply with the comment, he must clearly outline, with ample justification, the reasons for noncompliance within seven (7) calendar days after receipt of these comments in order that the comment can be resolved. The Contractor shall furnish disposition of all comments, in writing, with the next scheduled submittal. The Contractor is cautioned in that if he believes the action required by any comment exceeds the requirements of this contract, that he should take no action and notify the COR in writing immediately. Review conferences will be held for each design submittal at (Fort Shafter ). The Contractor shall bring the personnel that developed the design submittal to the review conference. These conferences will take place the week after the receipt of the comments by the Contractor.

7.3 Post review conference action. Copies of comments, annotated with comment action agreed on, will be made available to all parties before the conference adjourns. Unresolved problems will be resolved by immediate follow-on action at the end of conferences. Valid comments will be incorporated. After receipt of final (100%) corrected site/utility and building design documents upon incorporation of backcheck comments the contractor may proceed with site and building development activities within the parameters set forth in the contract and accepted design submittal. The Government, however, reserves the right to disapprove design document submittals if comments are significant (in the opinion of the Government, it does not comply with the contract documents nor the level of quality implied). If pre-final or final submittal(s) are incomplete or deficient, and require correction by the Contractor and re-submittal for review, the cost of rehandling and reviewing will be deducted from payment due the Contractor at the rate of $ 5,000.00 per submittal.

8.0 DESIGN ANALYSIS

8.1 Media and Format. Present the design analysis on 8-1/2-inch by 11-inch paper except that larger sheets may be used when required for graphs or other special calculation forms. All sheets shall be in reproducible form. The material may be typewritten, hand lettered, handwritten, or a combination thereof, provided it is legible. Side margins shall be 1-inch minimum to permit side binding and head to head printing. Bottom margins shall be 1-1/4-inches, with page numbers centered 1 inch from the bottom.

8.2 Organization. Assign the several parts and sheets of the design analysis a sequential binding number and bind them under a cover indicating the name of the facility and project number, if applicable. The title page shall carry the designation of the submittal being made. The complete design analysis presented for final review with the final drawings and specifications shall carry the designation "FINAL DESIGN ANALYSIS" on the title page.

8.3 Design Calculations. Design calculations are a part of the design analysis. When they are voluminous, bind them separately from the narrative part of the design analysis. Present the design calculations in a clean and legible form incorporating a title page and index for each volume. Furnish a table of contents, which shall be an index of the indices, when there is more than one volume. Identify the source of loading conditions, supplementary sketches, graphs, formulae, and references. Explain all assumptions and conclusions. Calculation sheets shall carry the names or initials of the author and the checker and the dates of calculations and checking. No portion of the calculations shall be computed and checked by the same person.

8.4 Automatic Data Processing Systems (ADPS). When ADPS are used to perform design calculations, the design analysis shall include descriptions of the computer programs used and copies of the ADPS input data and output summaries. When the computer output is large, it may be divided into volumes at logical division points. Precede each set of computer printouts by an index and by a description of the computation performed. If several sets of computations are submitted, a general table of contents in addition to the individual indices shall accompany them. Preparation of the description, which must accompany each set of ADPS printouts, shall include the following:

1. Explain the design method, including assumptions, theories, and formulae.
2. Include applicable diagrams, adequately identified.
3. State exactly the computation performed by the computer.
4. Provide all necessary explanations of the computer printout format, symbols, and abbreviations.
5. Use adequate and consistent notation.
6. Provide sufficient information to permit manual checks of the results.

9.0 DRAWINGS

9.1 General. Prepare all drawings on Computer-Aided Design and Drafting (CADD) so that they are well-arranged and placed for ready reference and so that they present complete information. The Contractor shall prepare the drawings with the expectation that the Corps of Engineers, in the role of supervision, will be able to construct the facility without any additional assistance from the Contractor. Drawings shall be complete, unnecessary work such as duplicate views, notes and lettering, and repetition of details shall not be permitted. Do not show standard details not applicable to the project, and minimize unnecessary wasted space. Do not include details of standard products or items, which are adequately covered by specifications on the drawings. Each Design Discipline shall provide a complete list of abbreviations and symbols used in their respective drawings. Detail the drawings such that conformance with the RFP can be checked and to the extent that shop drawings can be checked. Do not use shop drawings as design drawings. The design documents shall consist of drawings on a 36" x 24" format. The Contractor shall use standard Corps of Engineers title blocks and borders on all drawings. Submit an index of drawings with each submittal. The COR will furnish the Contractor file, drawing, and specification numbers for inclusion in the title blocks of the drawings.

9.2 Methods and Format. Create all drawings using CADD methods in MicroStation format. Save all Design Complete CADD files as MicroStation 8.0 or latest. The Contractor shall use EM 1110-1-1807 Standards Manual for U.S. Army Corps of Engineers Computer-Aided Design and Drafting (CADD) Systems as guidance to for standard details, cell libraries, title blocks, and layer/level assignments. Drawing features not addressed in EM 1110-1-1807 shall conform to drafting standards.

9.3 Use of Standard Fonts. Only standard fonts provided by MicroStation shall be used in the creation of CADD files. No fonts created by third parties or the designers are permitted.

9.4. Use of Reference Files. The uses of Reference files and Xrefs during the design stage are up to the discretion of the designers. All CADD files at Design Complete submittal shall be free standing, independent files, and not supported by reference files. All Reference files (MicroStation) shall be removed at Design Complete submittal.

9.5 Submittal Media. Submit all Design Complete CADD files on the following media.

-Read/Write CD-ROM Disk

10.0 SPECIFICATIONS

10.1 General. The Contractor shall submit marked-up and final specifications as required. The specifications may be any one of the major, well known master guide specification sources such as MASTERSPEC from the American Institute of Architects, SPECTEXT from Construction Specification Institute or Unified Facilities Guide Specifications (UFGS), etc. unless otherwise required. Use only one source for the project unless otherwise required. Edit the specifications for this project and submit in marked-up or redlined draft version at the Pre-Final Review submittal stage. If the design is based on a specific product, the specification shall consist of the important features of the product. The specification shall be detailed enough such that another product meeting the specification could be substituted and it would not adversely impact the project. After incorporation of comments, submit a final, design complete specification package. Delete all marked-out or redlined text and type in all inserted text.

10.2 Submittal Register. Develop the submittal requirements during construction during the design phase of the contract, by producing a Contractor Submittal Register during design. Attach a submittal register to each section of the specifications for the submittal requirements of that section. Prepare the Submittal Register on ENG Form 4288. The Contractor shall be responsible for listing all required submittals necessary to insure the project requirements are complied with. The Register shall identify submittal items such as shop drawings, manufacturer's literature, certificates of compliance, material samples, guarantees, test results, etc that the Contractor shall submit for review and/or approval action during the life of the construction contract. The Contractor shall place all the Submittal Register pages in an appendix of the final specifications.

**11. CONTENTS OF 50% DESIGN SUBMITTALS**

The 50% design submittals shall contain as a minimum, the following:

11.1 Paving, Grading and Drainage

11.1.1 Explanation of objectives and factors influencing siting decisions.
General overview of major site features planned, such as building orientation, drainage patterns, parking provisions, traffic circulation, provisions for the handicapped, security requirements, etc. Rationale for locating major site elements. Set back requirements or specific clearance requirements. Locations of borrow and spoil areas.

11.1.2 Requirements for flood protection. Selected storm drainage plan with respect to existing storm drainage system. Alternate schemes considered in arriving at selected plan. Disposition of storm water collected in the new system. Planned connections to the existing storm drainage system. Handling of roof runoff. Features and locations of special drainage structures. Types of materials to be specified for each installation. Selected design values to be used in the storm drainage calculations such as surface runoff coefficient, retardance coefficient, infiltration rate, and rainfall intensity based on a 10-year storm frequency. Design flood frequency and minimum elevation to provide flood protection. Planned finished floor elevations.

11.1.3 Slope stability analysis (cut and fill) and justification for any slopes steeper than 3:1 for cohesive soils and 4:1 for cohesionless soils.

11.1.4 Pavement design analysis shall include design method and all pertinent data including traffic types, volumes, soils data and any other data used to design the pavement structures. Flexible Pavements--required thickness of base and pavement based on the pavement design and

established subgrade CBR. Rigid Pavements--required thickness of nonreinforced concrete pavement and the established modulus of subgrade reaction.

11.1.5 Traffic volume and type. Particular AASHTO design vehicles for which turning movements are to be provided for and corresponding minimum turning radius.

11.1.6 Requirements for curbs, sidewalks, guardrails, traffic signs, markings, fencing, etc. Intersections or connections to existing roads and streets. Traffic routing during construction.

11.1.7 Site plan (geometry) and grading and drainage plan.

11.1.8 An overall site plan on one drawing showing all paving, grading and drainage.

11.1.9 Permit applications.

11.2 Geotechnical. A geotechnical report and design analysis.

11.3 Water Supply and Sanitary Sewage.

11.3.1 Design narrative and design calculations for the water supply and wastewater systems relating to this project. Include an analysis of the existing water distribution system capability to supply sufficient quantity at adequate pressures for fire protection. If the existing water distribution system is inadequate, provide the design solution to augment the water supply to meet the fire protection requirements. Design for wastewater systems shall show sewage flows, pipe sizes, routing, elevations, pump type and capacities, wet well sizing, etc. The Contractor shall present an analysis presenting proposed corrections of deficiencies or confirming the adequacy of the existing water supply system to support the proposed building.

11.3.2 Drawings developed to the point of showing in plan the anticipated systems and layout. Rough details of pumping systems or other features requiring detail drawings.

11.3.3 Anticipated permit requirements for water and wastewater features.

11.3.4 Lawn and Landscaping Irrigation System.
The design submittal shall include drawings clearly showing the piping layout and location of sprinkler heads coordinated with the landscaping plan, control valves, backflow preventers, rain check switches, controllers, etc. Indicate buildings, walks, shrubbery, trees, and other obstacles that might interfere with the proper operation of the sprinkler system. A design analysis calculating the pressures at each sprinkler head for the capacity and radius of throw is required. Details of the sprinkler head installation, valve boxes, and other irrigation appurtenances shall be submitted.

11.4 Landscape, Planting and Turfing.

11.4.1 The landscape planting design narrative shall describe the analysis of existing site conditions, including an indication of existing plant materials that are to remain on the site. The statement of concept shall indicate specific site problems related to proposed development and the rationale for proposed plant locations. The narrative shall also include a list of suggested types and sizes of plant materials which are to be used, based upon the designated functional and visual criteria.

11.4.2 The concept drawings shall be prepared at a scale which corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas, as needed, to clarify requirements. The proposed layout shall indicate shade trees, evergreen trees, flowering trees, shrub masses, etc., according to designated functional and visual locations of planting. A legend which also indicates sizes of plants recommended for each of the above categories shall be included. The drawings and all subsequent plans shall indicate existing and

proposed buildings, paved areas, signs, light standards, transformers, dumpster areas, storm drainage system, and other structures and utilities.

11.5 Architectural

11.5.1 Design narrative shall provide a summary of functional space relationships, as well as circulation. There shall also be a general statement for the rationale behind the major design decisions.

11.5.2 Plans shall indicate dimensions, columns lines, and detail references. Toilets and other specialized areas shall be drawn to ¼" scale and shall show any needed interior features.

11.5.3 Finish schedule shall indicate material, finishes, colors and any special interior design features such as soffits, fascias, and lighting troughs, etc.

11.5.4 All required equipment shall be shown on the drawings with an equipment list.

11.5.5 List any special graphics requirements that will be provided.

11.5.6 Schedules shall be provided for both doors and windows. These schedules shall indicate sizes, types, and details for all items shown on floor plans.

11.5.7 Hardware sets using Builders Hardware Manufacturers Association Inc. (BHMA) designations.

11.5.8 Composite floor plan showing all prewired workstations or kitchen equipment. Also show typical elevations of each type of workstation or equipment.

11.5.9 Comprehensive Interior Design (CID) package.

11.5.10 List all references used in the design including but not limited to Government design documents and industry standards.

11.5.11 Specifications: The architectural work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.

11.6. Structural Design.

11.6.1 State the live loads to be used for design. Include roof and floor loads; wind loads, lateral earth pressure loads, seismic loads, etc., as applicable.

11.6.2 Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

11.6.3 Furnish calculations for all principal roof, floor, and foundation members.

11.6.4 This submittal shall include drawings showing roof and floor framing plans as applicable. Principal members will be shown on the plans. A foundation plan shall also be furnished showing main footings and grade beams where applicable. Where beam, column, and footing schedules are used, show schedules and fill in sufficient items to indicate method to be used. Typical sections shall be furnished for roof, floor, and foundation conditions. Structural drawings for proposals and submittals shall be separate from architectural drawings.

11.6.5 Provide any computer analyses used shall be widely accepted, commercially available programs or complete documentation.

11.6.6 Antiterrorism/Force Protection (AT/FP) and Seismic Evaluation and Rehabilitation. The design analysis provided in the proposal submission shall be further developed. Complete the Government-furnished designs on AT/FP and seismic hazards mitigation, and provide detailed drawings reflecting the completed designs. Designs shall be stamped by a structural engineer licensed in the U.S.

11.6.7 A narrative description and supporting calculations shall show structural adequacy of existing structure to support new live loads. If existing floor systems will require strengthening to maintain structural integrity, provide an analysis and complete and detailed drawings showing the work.

11.7 Specific Mechanical and Plumbing Requirements:

11.7.1 List all references used in the design including Government design documents and industry standards.

11.7.2 Provide justification and brief description of the types of equipment, fixtures and piping materials proposed for use. Descriptions shall include narrative and catalog cuts.

11.7.3 Prepare detail calculations for systems such as sizing of air conditioning systems, heat recovery system, gas hot water heater and piping, and storage tanks.

11.7.3.1 Include computations for sizing equipment, air duct design, and U-factors for ceilings, roofs and exterior walls and floors. Contractor shall employ commercially available energy analysis techniques to determine the energy performance of all passive systems and features. Use of hourly energy load computer simulation (e.g., HAP, Trace, TRNSYS, DOE 2.1 Blast, etc.) is required. These calculations can be used to size the mechanical systems. Based on the results of calculations, provide a complete list of the materials and equipment proposed for heating and plumbing, with the manufacturer's published cataloged product installation specifications and roughing-in data. The heating and cooling equipment data shall include the manufacturer's wiring diagrams, installation specifications, ARI certification, and the standard warranty for the equipment.

11.7.4 include drawings of all areas including air conditioning, hot water, cold water, waste and vent piping. Drawings shall include plans, sections, piping isometric diagrams, control diagrams, DDC points list, sequence of operation, schedules and details. Minimum of 1:100 scale shall be used on all plan drawings, and building sections. Detailed drawings shall be minimum 1:50 scale. Detailed drawings shall be provided for all mechanical spaces including, but not limited to, toilet areas, mechanical rooms, chiller plant, hot water plant and fire pump building. Minimum drawing requirements are as follows:

Room designations.
Mechanical legend and applicable notes.
Location of all ductwork or piping
Location and capacity of all terminal units (i.e., registers, diffusers, grilles, variable air volume boxes).
Exhaust fan and range hood location.
Size of all ductwork 400 mm (16 in.) or larger in any dimension and piping 100 mm (4 in.) or larger
Location of heating/cooling plant (i.e., boiler, chiller, cooling tower, etc).
Location of all air handling equipment.
Return air paths (i.e., undercut doors, transfer grilles).
Flue piping size and location.
Fixture schedule and designations
Location of utility entrances.
Waste and water pipe location and size.
Details of any building penetration (i.e. louvers, penthouses, powered roof ventilators, vents, etc.)

11.7.4.1 Equipment Schedule: Complete equipment Schedules shall be provided. Schedule shall include at minimum:

Capacity
Electrical characteristics
Efficiency (if applicable)
Manufacturer's name
Optional features to be provided
Physical size
Weight

11.7.6 Specifications: The mechanical and plumbing work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.

11.8 Fire Protection

11.8.1 Design documents: All Fire Protection Design documents shall be in accordance with ER 1110-345-700 and are required to be submitted for approval prior to start of construction. Fire protection symbols in NFPA 170 shall be used. See Scope of work, Chapter 12 for acronym definitions used in this paragraph.

11.8.2 Fire Protection Analysis is required to be submitted in accordance with UFC 1-200-01 and UFC 3-600-1. Requirement must be stated with what is being provided in the project to meet this requirement. Include proposal submittal and the following: Hydraulic analysis and node sketch for all sprinkler systems to be installed in all buildings in accordance with FSC and UFC. Calculations confirming the adequacy of the existing water supply shall be provided. Hydrant flow test is required and flow data shall be submitted. Hydrant flow test shall be performed with the Schofield Barracks Water Treatment Plant clearwell pumps off. Calculations for any fire pump and tank shall be provided. Locations of all fire pumps and tanks shall be shown. All IBC allowable area, allowable height, construction type to be used and location on property requirements shall be submitted. Fire alarm system type (addressable) to be discussed. Discussion of all the life safety requirements of LSC shall be included.

11.8.3 Fire Protection Drawings:

11.8.3.1 General: Minimum of 1:100 scale shall be used on all plan drawings, and building sections. Drawings shall show fire alarm systems, sprinkler system and life safety requirements (fire barriers, exits, etc.). Detail drawings shall be minimum 1:50 scale. Minimum drawing requirements are as follows:

11.8.3.2 Automatic Fire Sprinkler system: Sprinkler head plans, attic plans, building sections, sprinkler riser with shutoff valve and tamper switch, alarm check valve, preaction/deluge valve, local alarm gong, flow/pressure switch, wall penetrations, fire rated wall penetrations, fire department connection locations, and sprinkler design parameters (occupancy hazard for each room, minimum sprinkler density to be used for each occupancy hazard, minimum design area, most hydraulically remote area, sprinklered areas). Detail fire pump plans, sections, isometric diagram of the fire pump system, tank plans, tank sections, tank details and piping layout and details.

11.8.3.3 Fire alarm system: Plans showing location of all initiation devices (manual pull stations, duct smoke detectors, sprinkler flow switches, smoke detectors, magnetic door holders), visible/audible notification appliances, supervisory devices (tamper switches, low pressure switches), fire alarm panel, fire alarm exterior annunciator, and fire alarm diagram.

11.8.3.4 Life Safety: All fire rated walls shall be shown where they begin and where they end. All fire rated shafts, stairs, vertical openings, seismic joints shall be shown. Fire rated doors, fire rated door frames, fire rated windows and window frames, door hardware, fire dampers, and smoke dampers are to be shown with the appropriate fire rating in hours.

11.8.3.5 IBC requirements: Site plan showing the location of the project buildings in relation to other existing buildings, roads, parking lots, fuel tanks, water tanks, electric poles, exterior power lines.

11.8.3.6 Means of egress lighting and LED type exit signs meeting LSC shall be shown on the plans.

11.8.4 Specifications.

11.8.4.1 General requirements: The fire protection work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS) sections 13920 Fire Pumps, 13930 Wet Pipe Sprinkler System, Fire Protection, 13945 Preaction/Deluge Sprinkler System, Fire Protection, 13851 Fire Detection and Alarm System Addressable, and 7840 Firestopping. Edited UFGS specification sections shall be used and revised in accordance with the restrictions in ER 1110-345-700, Appendix D and the following:

11.8.4.2 Sprinkler systems: No plastic piping or fittings, and “T drill method” are allowed. Sprinkler system design area, density and hydrant demand shown in 1008C shall be followed. Sway bracing and branch restraints are required. Government Shop drawing submittal approval and preparer approval is required.

11.8.4.3 Fire alarm systems: Class A looped fire alarm system is required. “T taps” are prohibited. Fire Protection Engineer qualification approval, Fire Protection Engineer shop drawing approval and fire alarm shop drawing submittal approval by the Government are required. Modify the operations paragraph to meet the Attachment Fire Alarm Control Matrix control sequence.

11.8.4.4 Firestopping, fire dampers, fire rated doors/door frames, smoke dampers, and exit signs, must be submitted for Government approval.

11.9 Interior Electrical System

11.9.1 The power riser or one-line diagram shall be essentially complete except for finalization of conduit and wire sizes.

11.9.2 Panelboards, switchboards, switchgear, motor control centers, and all other utilization equipment shall be located on the floor plans. Schedules for applicable equipment shall be provided. The schedules shall include all pertinent information to fully describe the equipment. Elevations for free standing equipment shall be provided but need not be entirely finalized.

11.9.3 Details of the layouts for electrical closets and rooms shall be shown.

11.9.4 Receptacles and light fixture layouts (wiring not required at this stage) shall be shown for all rooms.

11.9.5 Areas where nonlinear loads will be encountered shall be identified. Per the requirements of paragraphs 4c and 4g of ETL 1110-3-403, the use of 75 degree C. (minimum) conductors is required. Branch circuits serving eight-wire systems furniture or groups of nonlinear loads shall be 3#12, 1#10 N., 1#12 GND. and 1#12 Isolated GND. Feeders serving panelboards with nonlinear loads shall have the neutral conductor ampacity based on at least 1.73 times the ampacity of the phase conductors. The neutral bus in the panelboards shall have the same criteria. The simplest way to accomplish the upsizing of the neutral conductor is to provide double ampacity neutrals or parallel conductors in sizes permitted by the National Electrical Code.

11.9.6 A completed fixture schedule shall be included on the drawings.

11.9.7 All removals shall be shown on demolition plans.

11.9.8 Describe energy conservation measures and/or techniques that are being incorporated into

the design.

11.10 Exterior Electrical Distribution System

11.10.1 In a narrative, clearly describe the electrical distribution system and state the changes to be made to the existing system to accommodate this project. State any deficiencies to be corrected and provide a description of all new work being performed.

11.10.2 State the electrical characteristics of the power supply from the service point to the main service equipment.

11.10.3 Indicate the type, number, voltage rating and connections, and kVA rating of all transformers provided.

11.10.4 State the type of conductor to be used and provide a justification for its use.

11.10.5 Include a statement describing the criteria used for the exterior design such as primary and secondary voltage drop. Describe the physical characteristics of both the underground and overhead power lines. Provide the short circuit current available at the site and state the source of this value.

11.10.6 Include a description of all exterior lighting systems included in the design. Identify the fixture types, poles and design lighting levels. Provide point-to-point calculations showing that all design levels have been achieved.

11.10.7 All of the exterior electrical design drawings shall show all poles (lighting), underground conductors, manholes, handholes, ductbanks, and all pertinent components identified on the site plans. Details shall include but not limited to poles, manholes, handholes, ductbanks, etc. Calculations shall support all new manhole and handhole locations.

11.10.8 All removals shall be shown on demolition plans.

11.11. Electronic Systems

Public Address System
Telecommunications System
Cable Television System
Intrusion Detection
Personal Alert (Mass Notification) System

Provide a descriptive narrative of all electronic systems that are required for this project. The design analysis shall include all calculations required to support design decisions and estimates at this stage of design. The analysis shall include specific criteria furnished, conference minutes and cost analyses of all systems considered.

11.11.1. Show location of telecommunications outlets (including pay phones) on the plans. Include legend and symbol definition to indicate height above finished floor. Show a Telecommunication Conduit System Riser Diagram.

11.11.2. Verification of the validity of any existing drawings and/or any other data furnished by the Government shall be the responsibility of the engineering services firm.

11.11.3. Provide a statement describing the extent of any exterior work such as telecommunication lines, cable television (TV) distribution cables, duct banks, etc., outside of 5 feet from the building line.

11.11.4. Exterior work to be shown on electrical site plan:

Existing and new telecommunications and cable television service lines, both overhead and underground, shall be properly identified.
Show removals and relocations, if any.

11.11.5. Show the location of all electronic system panels, devices, outlets, etc., on the floor plans. Show the proposed riser diagrams for all systems. Show typical sizes of all conduit, wires, cables, panels, etc. Provide a complete symbol legend for all devices or equipment shown on the plans. For work requiring removals or demolition, the designer shall show by use of drawings or narrative, how demolition work is to be done.

11.12. Submit outline specifications unless otherwise indicated above.

11.13. Submit the SPIRIT rating sheet for sustainable level compliance as indicated in the SOW.

**13.0 CONTENTS OF OTHER DESIGN SUBMITTALS**

13.1 The 90% pre-final site/utility design submittal shall contain as a minimum, the following:

13.1.1 General Narratives:

13.1.1.1 Site/Layout: Explanation of objectives and factors influencing siting decisions. General overview of major site features planned, such as building orientation, drainage patterns, parking provisions, traffic circulation, provisions for the handicapped, security requirements, etc. Rationale for locating major site elements. Set back requirements or specific clearance requirements. Locations of borrow and spoil areas.

13.1.1.2 Utility Systems: Design narrative for the water supply, storm drainage, wastewater, electrical, and telecommunications systems relating to this project. Include an analysis of the existing distribution systems capability to supply sufficient quantity at adequate levels. If the existing distribution systems are inadequate, provide the design solution to augment the systems to provide the requirements for the new facilities.

13.1.2 All drawings included in the required technical data for the proposal submission (see SECTION 01010: STATEMENT OF WORK), shall be developed to 90 percent completion. In addition to the individual utility plans, submit a combined utility plan drawn to the same scale as the individual utility plans.

13.1.2.1 General Site Layout: Label and tie down locations of new site elements (buildings, walks, curbs, new pavements surfaces, gutters, parking, trash enclosures, bicycle racks, etc.) Scale shall be included.

13.1.2.2 Site Grading and Drainage Plans: Show locations of all sediment basins, diversion ditches, and other erosion control structures. Indicate the approximate drainage areas each will service. Indicate the materials, construction and capacity of each structure. Include limits of landscaping and seeded areas. Provide building grade sections(at least one view per axis of building(s) and extended through grading limits). General site grading and drainage shall be indicated by contour lines with an interval of not more than approximately 0.5 m [1.5 feet].

13.1.2.3 Road Alignment Plans: Scale shall be no greater than as indicated in SECTION 01010: STATEMENT OF WORK and profiles showing pavement and shoulder widths, azimuths and curve data, limits of grading, and erosion control. The materials to be used shall be indicated.

13.1.2.4 Traffic Control Plan: Traffic routing and signage shall be in accordance with The Manual on Uniform Traffic Control Devices for Streets and Highways, U.S. Department of Transportation, Federal Highways Administration.

13.1.2.5 Sanitary Sewer and Water Plan: Scale shall be as indicated in SECTION 01010: STATEMENT OF WORK and profiles showing location and elevation of pipe, thrust blocks, manholes, valves connections, etc. Materials and construction of pipes, valves, valve boxes, sewage treatment systems and appurtenances shall be indicated. Specifications shall be provided.

13.1.2.6 Electrical Plan Requirements:

13.1.2.6.1 Required diagrams and details on Site Electrical and Telecommunications Drawings.

13.1.2.6.1.a. Off-Site Electrical and Telecommunications Distribution Plans:
13.1.2.6.1.b. Off-Site Primary Circuit Routing Plans:
13.1.2.6.1.c. Off-Site One Line Diagrams
13.1.2.6.1.d. Off-Site Details.
13.1.2.6.1.e. On-Site Electrical and Telecommunications Distribution Plans:
13.1.2.6.1.f. On-Site One Line Diagrams
13.1.2.6.1.g. On-Site Distribution Transformer Schedule: Provide with the following headings:
Transformer Designation. Transformer Size (KVA). Building(s) Served.
Primary Phase(s) and Circuit to which connected.
13.1.2.6.1.h. On-Site Details (Site Lighting, Trenching, Duct Sections, Manholes, Pad-Mounted Transformers and Switches, etc.).

13.1.2.6.2 See Chapter 9, Electrical Systems, for other design requirements.

13.1.2.7 Specifications: Provide pre-final draft marked-up specifications, which include all sections, which apply to site/utility work.

13.1.2.8 Design Analysis: Design analysis shall include design calculations fully developed to support the design of the site and utility systems included in this submittal.

13.1.2.9 Geotechnical: Soils analysis and geotechnical report. Geotechnical information must be provided to support all assumptions and design parameters utilized in the presented site/utility design as applicable.

13.2 <u>The Final 100% site/utility submittal</u> shall contain as a minimum, the following:

13.2.1 General: A complete set of construction documents plans and specifications at the same level of detail as if the project were to be bid including a complete list of equipment, fixtures and materials to be used. The final (100%) drawings are an extension of the reviewed 90% drawings and are to include the 90% comments and responses. All details shall be shown on the drawings.

13.2.2 The design analysis is an extension o the reviewed 90% design analysis and supports and verifies the design complies with the requirements of the project.

13.2.3 The Final (100%) drawings are an extension of the review 90% drawings and include all revisions incorporated from the 90% review comments.

13.2.3. Provide Final (100%) specifications. The Contractor shall make final identification of all materials at this stage.

13.3 <u>The 90% pre-final building and landscaping design submittal</u> shall contain as a minimum, the following:

13.3.1 Landscaping and Irrigation System: The design submittal shall include drawings clearly showing the piping layout and location of sprinkler heads coordinated with the landscaping plan,

control valves, backflow preventers, rain check switches, controllers, etc. Indicate buildings, walks, shrubbery, trees, and other obstacles that might interfere with the proper operation of the sprinkler system. A design analysis calculating the pressures at each sprinkler head for the capacity and radius of throw is required. Details of the sprinkler head installation, valve boxes, and other irrigation appurtenances shall be submitted.

13.3.2 Landscape, Planting and Turfing

13.3.2.1 The landscape planting design narrative shall describe the analysis of existing site conditions, including an indication of existing plant materials that are to remain on the site. The statement of concept shall indicate specific site problems related to proposed development and the rationale for proposed plant locations. The narrative shall also include a list of suggested types and sizes of plant materials, which are to be used, based upon the designated functional and visual criteria.

13.3.2.2 The drawings shall be prepared at a scale which corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas, as needed, to clarify requirements. The proposed layout shall indicate shade trees, evergreen trees, flowering trees, shrub masses, etc., according to designated functional and visual locations of planting. A legend that also indicates sizes of plants recommended for each of the above categories shall be included. The drawings and all subsequent plans shall indicate existing and proposed buildings, paved areas, signs, light standards, transformers, dumpster areas, storm drainage system, and other structures and utilities.

13.3.3 Architectural

13.3.3.1 The architectural analysis, drawings and specifications shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Architectural specifications must be complete with all edits incorporated in the specification text.

13.3.3.2 Details: Complete Construction details, sections, interior elevations, exterior elevations, etc., shall be provided to describe the methods and materials of design.

13.3.3.3 Pre-wired workstation composite floor plans. Pre-wired workstation typicals - elevations and component inventory. Pre-wired workstation panel identification plan with electrical outlet placement including base feed.

13.3.3.4 Comprehensive Interior Design package shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal.

13.3.4 Structural Systems

13.3.4.1 State the live loads to be used for design. Include roof and floor loads; wind loads, lateral earth pressure loads, seismic loads, etc., as applicable.

13.3.4.2 Describe the method of providing lateral stability for the structural system to meet seismic and wind load requirements. Include sufficient calculations to verify the adequacy of the method.

13.3.4.3 Furnish calculations for all principal roof, floor, and foundation members.

13.3.4.4 This submittal shall include drawings showing roof and floor framing plans as applicable. Principal members will be shown on the plans. A foundation plan shall also be furnished showing main footings and grade beams where applicable. Where beam, column, and footing schedules are

used, show schedules and fill in sufficient items to indicate method to be used. Show typical bar bending diagram if applicable. Typical sections shall be furnished for roof, floor, and foundation conditions. Structural drawings for proposals and submittals shall be separate from architectural drawings.

13.3.4.5 Provide any computer analyses used shall be widely accepted, commercially available programs and complete documentation of the input and output of the program.

13.3.4.6 Provide complete seismic analyses for all building structural components. Seismic calculations shall clearly demonstrate compliance with all requirements set forth in the Statement of Work.

13.3.5 Specific Mechanical and Plumbing Requirements:

13.3.5.1 The mechanical and plumbing analysis, drawings and specifications shall include the 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Mechanical and plumbing specifications must be complete with all edits incorporated in the specification text.

13.3.5.2 Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design. All roof and exterior wall penetrations shall be detailed on the drawings.

13.3.6 Fire Protection: The Fire protection analysis, drawings and specifications shall include 50% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. Fire protection specifications must be complete with all edits incorporated in the specification text.

13.3.7 Electrical and Electronic Systems Requirements

13.3.7.1 The Electrical and Electronic systems design analysis, drawings, and specifications shall include the 50% submittal with corrections incorporated, including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 50% submittal. All requirements specified in the 50% submittal must be developed and completed to this 90% stage.

13.3.7.2 Electrical and Electronics Floor Plans. The floor plans shall show all principle architectural features of the building, which will affect the electrical design. The floor plans shall also show (but not limited to) the following:

Room designations.
Electrical legend and applicable notes.
Lighting fixtures, properly identified.
Location of smoke detectors and fire alarm devices
Location of telecommunication and cable TV outlets.
Location of all electronic systems devices
Switches for control of lighting.
Receptacles.
Location and designation of panel boards. Plans should clearly indicate type of mounting required (flush or surface) and be reflected accordingly in specifications. Service entrance (conduit and main disconnect).
Location, designation and rating of motors and/or equipment which requires electrical service. Show method of termination and/or connection to motors and/or equipment. Show necessary junction boxes, disconnects, controllers (approximate only), conduit stubs, and receptacles required to serve the motor and/or equipment.
All circuit wiring and cables (number and sizes)
All conduit runs and sizes

All riser and one line diagrams
All other electrical and electronic equipment

13.3.7.3. Building Riser Diagram (from pad-mounted transformer to unit load center panel board): Indicate the types and sizes of electrical equipment and wiring. Include grounding and metering requirements.

13.3.7.4. Load Center and Panelboard Schedule(s): Schedule shall indicate the following information:

Load Center/Panelboard Characteristics (Panel Designation, Voltage, Phase, Wires, Main Breaker Rating and Mounting)
Branch Circuit Designations.
Load Designations.
Circuit Breaker Characteristics. (Number of Poles, Trip Rating, AIC Rating)
Branch Circuit Connected Loads (AMPS).
Special Features.

13.3.7.5 Lighting Fixture Schedule: (Schedule shall indicate the following information:)

Fixture Designation.
General Fixture Description.
Number and Type of Lamp(s).
Type of Mounting.
Voltage
Special Features.

13.3.7.6. Details: Details of all light fixtures shall be provided. Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design.

13.3.7.7 Electrical and Electronic systems specifications must be complete with all mark-ups and edits incorporated in the specification text.

13.3.7.8 Design analysis and calculations for the electrical systems shall be prepared by a licensed professional engineer with experience and shall be stamped as such. The design analysis shall be separately bound, in one or more volumes. The design analysis shall include all calculations required to support design decisions, including (but not limited to) lighting calculations, voltage drop calculations, load calculations (for transformers, conductor sizes, circuit breaker sizes, panelboard sizes, etc.), and short circuit calculations. The analysis shall also include specific criteria furnished, conference minutes, and cost analyses of all systems considered. Show functional and engineering criteria, design information, and calculations applicable to the project. The analysis shall be organized in a format appropriate for review, approval, and record purposes. The design calculations shall indicate methods and references identified, and shall explain assumptions and conclusions.

13.3.7.9. Voltage Drop (VD) Calculations: Select conductor sizes of primary feeders, site lighting circuits, service laterals, and unit feeder conductors. Calculate maximum length for each phase of each primary circuit, using a maximum allowable VD for each circuit. Calculate voltage drops for each conductor. Maximum allowable voltage drop for site lighting and service laterals is 3%. The combined voltage drop for the service laterals, unit feeders, and branch circuit cannot exceed 5%.

13.3.7.10 See Chapter 9, Electrical Systems, for other design requirements.

13.3.8 Kitchen Requirements: List all references used in the design including Government design documents and industry standards. Provide justification and brief description of the types of equipment, fixtures and piping materials proposed for use. Descriptions shall include narrative and catalog cuts. Prepare detail calculations for systems such as sizing of makeup air systems, exhaust

systems, refrigeration equipment, kitchen equipment and gas piping. List of the materials and equipment proposed shall include the manufacturer's published cataloged product installation specifications and roughing-in data. The data shall include the manufacturer's wiring diagrams, installation specifications, certifications, and the standard warranty for the equipment. Include drawings of all areas. Drawings shall include plans, sections, piping isometric diagrams, control diagrams, sequence of operation, schedules and details. Minimum of 1:50 scale shall be used on all plan drawings, and building sections. The kitchen work for the project shall be constructed in accordance with Unified Facilities Guide Specifications (UFGS). Edited UFGS specification sections shall clearly indicate design intent including products and execution to be provided.

13.3.9 Specifications: Draft of specifications, including index and trade sections.

13.3.10 Sustainable Design: Provide a completed SPiRiT checklist to show compliance with the level indicated in the SOW and incorporated comments on the previous design submittal.

13.4 <u>The Final 100% building and landscaping design submittal</u> shall contain, as a minimum, the following items for all submittals:

13.4.1 General: A complete set of construction documents plans and specifications at the same level of detail as if the project were to be bid including a complete list of equipment, fixtures and materials to be used. The final drawings are an extension of the reviewed 90% drawings and are to include the 90% comments and responses. All details shall be shown on the drawings.

13.4.2 The design analysis is an extension of the reviewed 90% design analysis and supports and verifies that the design complies with the requirements of the project.

13.4.3 Submit final specifications. The specifications shall be coordinated with the drawings and describe in detail all items shown on the drawings.

13.4.4 Landscape and Planting Final design drawing(s) shall include a complete schedule of plant materials which indicates their botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. The drawings shall be prepared at a scale that corresponds with the site layout and grading plans and, likewise, shall include reference coordinates, north arrows, graphic scales and appropriate legends. An overall planting layout shall be developed and shall include enlarged detail plans of specific areas as needed, to clarify requirements. Final design drawings, indicating proposed plants by a (+) mark for the plant location and a circle which is scaled at approximately 2/3 the ultimate growth spread (diameter) of plants, shall also include a complete schedule of plant materials which indicates botanical and common names, plan symbols, quantities, sizes, condition furnished, and pertinent remarks. Final drawings shall also include the basic details for installation of tree, shrub, and ground cover planting, as well as any other applicable details for clarification of specific project requirements.

13.4.5 Architectural

13.4.5.1 The architectural analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 50% submittal based on comments on the 90% submittal. Architectural specifications must be complete with all edits incorporated in the specification text.

13.4.5.2 All architectural drawings shall be coordinated with the other engineering disciplines. Ensure that the plans are in compliance with the applicable codes. It will be the Contractor's responsibility to implement the comments generated from any design review submittal as well as verify the consistency between plans and specification. The evaluation of the Contractor's submittals shall be based on degree to which the submittal meet the requirements set forth in this document and the specifications.

13.4.5.4 Comprehensive Interior Design package shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal.

13.4.6 Structural Design

13.4.6.1 Furnish complete checked calculations for all structural members. Incorporate any changes required by comments on 90% Design Submittal.

13.4.6.2 Prior to this submittal, structural drawings shall be coordinated with all other design disciplines.

13.4.6.3 The final structural drawings shall contain the following information as a set of general notes:

The allowable soil bearing value.
The design stresses of structural materials used.
The design live loads used in the design of various portions of the structures.
The design wind speed.
The seismic acceleration coefficients, seismic use group, and performance level criteria used in design.

13.4.6.4 All structural drawings and calculations shall be checked and stamped by the designer of record (a registered Professional Engineer).

13.4.7 Specific Mechanical and Plumbing Requirements:

13.4.7.1 The mechanical and plumbing analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Mechanical and plumbing specifications must be complete with all editions incorporated in the specification text.

13.4.7.2 In addition to items submitted in the paragraph 11.4.7.1, the drawings shall be revised to include:

Double line ductwork
Double line piping for all piping 100 mm (4 in.) or larger on 1:50 drawings
Double line piping for all piping 200 mm (8 in.) or larger on 1:100 drawings
Thermostat locations
Size of all ductwork
Size of all piping
All details

13.4.7.3 Details: Construction details, sections, elevations, etc., shall be provided where required for clarification of methods and materials of design. All roof and exterior wall penetrations shall be detailed on the drawings.

13.4.8. Fire Protection: The Fire protection analysis, drawings and specifications shall include 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Fire protection specifications must be complete with all editions incorporated in the specification text.

13.4.9 Specific Electrical and Electronic Requirements:

13.4.9.1 The Electrical and Electronic systems design analysis, drawings, and specifications shall include the 90% submittal with corrections incorporated, including the annotated comments indicating

what corrections were done on the 90% submittal based on comments on the 90% submittal. All requirements specified in the 90% submittal must be developed and completed to this 100% stage.

13.4.10 Kitchen Requirements: The kitchen design analysis, drawings and specifications shall include the 90% submittal with corrections incorporated including the annotated comments indicating what corrections were done on the 90% submittal based on comments on the 90% submittal. Mechanical and plumbing specifications must be complete with all editions incorporated in the specification text.

13.4.11 Specifications: Provide final specifications. The Contractor shall make final identification of all materials and finishes at this stage.

13.4.11 Sustainable Design: Provide a revised completed SPiRiT checklist to show compliance with the bronze level of the SpiRiT checklist due to changes in the design from the 90% submittal to the 100% submittal.

13.5 <u>Design complete submittal:</u>

13.5.1 Design Drawings: Drawings shall be 100% complete, signed and sealed by the designer of record. All previous review comments shall be incorporated.

13.5.2 Design Analysis: Complete design analysis for all design disciplines. The final Fire Protection and Life Safety Analysis shall be included in the Design Analysis.

13.5.3 Comment Response Package: Complete package showing all comments from all previous reviews and the respective response and disposition.

13.5.4 This submittal shall include all drawings and design information from the 100% site/utility submittal to form a complete design package.

13.5.3 Additional Requirements.

a. Compliance Certification

(1) The Contractor shall certify that the features and standards offered in its submittals meet or exceed the corresponding mandatory features and standards stated in the Scope of Work. A certification to this effect shall be included on the title sheet of each submittal made under this section. The certification shall be signed by the person(s) authorized to bind the offeror under the offer, or by persons who have been delegated, in writing such authorization.

(2) The parties understand that, at the time of award, all features and standards proposed in the Contractor's accepted offer, including the mandatory requirements of the RFP, as amended by the Contractor's accepted offer, become binding upon both the Government and the Contractor. Deviations from the features and standards of the accepted offer, including deviations from the RFP's mandatory requirements, as amended by the accepted offer, may be approved by the Contracting Officer upon written application by the Contractor and agreement as to good and sufficient consideration by the parties, reflected in an equitable adjustment to the contract price.

b. Field Inspection. The Contractor shall verify field conditions, which are significant to design, by field inspection, researching and obtaining all necessary as-built drawings and reproducing them for his own use as necessary, and discussing status with knowledgeable personnel. The information shall be reflected in the design documents.

c. Additional Topographic Information. The Government has supplied all or a majority of the topographic information required for the project as part of the topographic survey sheets provided in the Request for Proposals drawings. Any additional topographic information required by the Contractor for design after award of the contract shall be procured and paid for by the successful Proposer.

d. Soil and Foundation Report. A final and complete soil and foundation report shall be furnished by the Contractor in accordance with Site Engineering Section of the Statement of Work.

## 14.0 DESIGN RELATED PRODUCTS

14.1 Architectural Renderings: Contractor shall provide the original and three copies of each ground level perspective artist's renderings of completed typical facilities with walks, parking, and landscaping. Renderings shall be no smaller than 14" x 18" or larger than 28" x 36", multi-colored, and shall be suitably titled, matted, and framed.

14.2 DD Form 1354: Three (3) sets of DD Form 1354, Transfer and Acceptance of Military Real Property shall be prepared in accordance with ER 415-345-38 and submitted to the Contracting Officer.

14.3 Reproduction: Upon Government approval of 100% design documents, the original will be returned to the Contractor for reproduction purposes. The Contractor will be responsible for his own reproduction as well as reproduction for Government use. The Government will require twice the number of copies of the plans and specifications as were required for the review stages, no color boards will be required. The originals will be retained by the Contractor for recording of as-built conditions. Upon completion of the project, the original design documents corrected to reflect as-built conditions will be supplied to the Government.

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SECTION 01312

QUALITY CONTROL SYSTEM (QCS)

## PART 1 GENERAL

### 1.1 GENERAL

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in t
he following areas:

Administration
Finances
Quality Control
Submittal Monitoring
Scheduling
Import/Export of Data

#### 1.1.1 Applicability

QCS shall be used during both the design and construction phases of the contract.

#### 1.1.2 Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

#### 1.1.3 Other Factors

Particular attention is directed to Contract Clause, "Schedules for Construction Contracts", Contract Clause, "Payments", Section 01320, PROJECT SCHEDULE, Section 01330, SUBMITTAL PROCEDURES, and Section 01451, CONTRACTOR QUALITY CONTROL, which have a direct relationship to the reporting to be accomplished through QCS. Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the pricing for the work.

## 1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the contract. Prior to the Pre-Design Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website:

(http://winrms.usace.army.mil/contractor's.htm).

Upon specific justification and request by the Contractor, the Government can provide QCS on 3-1/2 inch high-density diskettes or CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

## 1.3 SYSTEM REQUIREMENTS

The following listed hardware and software is the minimum system configuration that the Contractor shall have to run QCS:

a. HARDWARE

(1) IBM-compatible PC with 200 MHz Pentium or higher processor 32+ MB RAM

(2) 4 GB hard drive disk space for sole use by the QCS system

(3) 3 1/2 inch high-density floppy drive

(4) Compact disk (CD) Reader

(5) Color monitor

(6) Laser printer compatible with HP LaserJet III or better, with minimum 4 MB installed memory.

(7) Connection to the Internet, minimum 28 BPS

b. SOFTWARE

(1) MS Windows 95 or newer version operating system (MS Windows NT 4.0 or newer is recommended)

(2) Word Processing software compatible with MS Word 97 or newer

(3) Internet browser

(4) The Contractor's computer system shall be protected by virus protection software that is regularly upgraded with all issued manufacturer's updates throughout the life of the contract.

(5) Electronic mail (E-mail) compatible with MS Outlook

## 1.4 RELATED INFORMATION

### 1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

### 1.4.2 Contractor Quality Control (CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager in the course entitled, "Construction Quality Management For Contractors" (Section 01451).

## 1.5 CONTRACT DATABASE

Prior to the pre-design conference, the Government will provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

## 1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by the Contracting Officer, a data diskette or CD-ROM may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM). The QCS database typically shall include current data on the following items:

### 1.6.1 Administration

#### 1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

#### 1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic

format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.5 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a data diskette may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document

progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a quality control plan within the time required in Section 01451, CONTRACTOR QUALITY CONTROL. Within seven calendar days of Government acceptance, the Contractor shall submit a data diskette or CD-ROM reflecting the information contained in the accepted quality control plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required by Section 01451, CONTRACTOR QUALITY CONTROL. Reports shall be submitted electronically to the Government using E-mail or diskette within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.6.3.4 Accident/Safety Tracking

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 200.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the

QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

#### 1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

### 1.6.4 Submittal Management

The Contractor shall develop the initial submittal register, ENG Form 4288, SUBMITTAL REGISTER, from the submittal list provided by its Designer of Record. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update, ENG Form 4288, shall be produced using QCS. QCS and RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

### 1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Section 01320, PROJECT SCHEDULE. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF) (see Section 01320 PROJECT SCHEDULE). The updated schedule data shall be included with each pay request submitted by the Contractor.

### 1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

## 1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

## 1.8 DATA SUBMISSION VIA COMPUTER DISKETTE OR CD-ROM

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file

attachment(s). For locations where this is not feasible, the Contracting Officer may permit use of computer diskettes or CD-ROM for data transfer. Data on the disks or CDs shall be exported using the QCS built-in export function. If used, diskettes and CD-ROMs will be submitted in accordance with the following:

### 1.8.1 File Medium

The Contractor shall submit required data on 3-1/2 inch double-sided high-density diskettes formatted to hold 1.44 MB of data, capable of running under Microsoft Windows 95 or newer. Alternatively, CD-ROMs may be used. They shall conform to industry standards used in the United States. All data shall be provided in English.

### 1.8.2 Disk or CD-ROM Labels

The Contractor shall affix a permanent exterior label to each diskette and/or CD-ROM submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name and telephone number of person responsible for the data.

### 1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

## 1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions. The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

## 1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

# PART 2 PRODUCTS (Not Applicable)

# PART 3 EXECUTION (Not Applicable)

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SECTION 01320

PROJECT SCHEDULE

## PART 1 GENERAL

### 1.1 ELECTRONIC SCHEDULE REQUIREMENT

The Project Schedule to be prepared by the Contractor shall be electronically prepared using software capable of generating a data file in the Standard Data Exchange Format (SDEF). The Project Schedule shall consist of a network analysis system as described below. In preparing this system the scheduling of Construction is the sole responsibility of the contractor. The requirement for the system is included to assure adequate planning in the execution of the work and to assist the Contracting Officer in appraising the reasonableness of the proposed schedule and evaluating progress of the work for the purposes of payment.

### 1.2 SUBMITTALS

Government acceptance is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preliminary Project Schedule; G.
Initial Project Schedule; G.
Periodic Schedule Updates; G.

Four copies of the schedules showing codes, values, categories, numbers, items, etc., as required.

Periodic schedule updates shall be submitted monthly.

SD-06 Test Reports

Narrative Report.
Schedule Reports.

Four copies of the reports showing numbers, descriptions, dates, float, starts, finishes, durations, sequences, etc., as required.

SD-07 Certificates

Qualifications; G.

Documentation showing qualifications of personnel preparing schedule reports.

## 1.3 QUALIFICATIONS

The Contractor shall designate an authorized representative who shall be responsible for the preparation of all required project schedule reports. This person shall have previously created and reviewed computerized schedules using the software selected by the Contractor. Qualifications of this individual shall be submitted to the Contracting Officer for review with the Preliminary Project Schedule submission.

# PART 2 PRODUCTS (Not Applicable)

# PART 3 EXECUTION

## 3.1 GENERAL

Pursuant to the Contract Clause, SCHEDULE FOR CONSTRUCTION CONTRACTS, a Project Schedule as described below shall be prepared. The Contractor shall be responsible for scheduling of all design, procurement and construction activities. Contractor management personnel shall actively participate in its development. Designers of record, consultants, subcontractors and suppliers working on the project shall also contribute in developing and maintaining an accurate Project Schedule. The accepted Project Schedule shall be used to measure the progress of the work, to aid in evaluating time extensions, and to provide the basis of all progress payments.

## 3.2 BASIS FOR PAYMENT

The schedule shall be the basis for measuring Contractor progress. Lack of an accepted schedule or scheduling personnel shall result in an inability of the Contracting Officer to evaluate Contractor progress for the purposes of payment. Failure of the Contractor to provide all information, as specified below, shall result in the disapproval of the entire Project Schedule submission and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes. In the case where Project Schedule revisions have been directed by the Contracting Officer and those revisions have not been included in the Project Schedule, then the Contracting Officer may hold retainage up to the maximum allowed by contract, each payment period, until revisions to the Project Schedule have been made.

## 3.3 ELECTRONIC PROJECT SCHEDULE

The computer software system utilized by the Contractor to produce the Project Schedule shall be capable of providing all requirements of this specification. Failure of the Contractor to meet the requirements of this specification shall result in the disapproval of the schedule. Manually generated schedules will not be accepted.

The system noted below is capable of generating a file in the Standard Data Exchange Format (SDEF). All electronic data submittals shall be in SDEF. SDEF information is available from the Contracting Officer.

Vendor/System with SDEF support:
Primavera Systems PRIMAVERA PROJECT PLANNER (P3)

### 3.3.1 Use of the Critical Path Method

The Critical Path Method (CPM) of network calculation shall be used to generate the Project Schedule. The Contractor shall provide the Project Schedule in either the Precedence Diagram Method (PDM) or the Arrow Diagram Method (ADM).

### 3.3.2 Level of Detail Required

With the exception of the preliminary schedule submission, the Project Schedule shall include an appropriate level of detail. Failure to develop or update the Project Schedule or provide data to the Contracting Officer at the appropriate level of detail, as specified by the Contracting Officer, shall result in the disapproval of the schedule. The Contracting Officer will use, but is not limited to, the following conditions to determine the appropriate level of detail to be used in the Project Schedule.

#### 3.3.2.1 Activity Durations

Contractor submissions shall follow the direction of the Contracting Officer regarding reasonable activity durations. Reasonable durations are those that allow the progress of activities to be accurately determined between payment periods (usually less than 2 percent of all non-procurement activities' Original Durations shall be greater than 20 days).

#### 3.3.2.2 Design and Permit Activities

The Contractor shall integrate design and permitting activities, including necessary conferences and follow-up actions and design package submission dates into the schedule. The design schedule showing the sequence of events involved in carrying out the design tasks within the specific contract period shall be included in the project schedule. The design schedule should be at a detailed level of scheduling sufficient to identify all major tasks including those that control the flow of work. The design schedule shall include review and correction periods associated with each item. This should be a forward planning as well as a project-monitoring tool. The schedule shall reflect calendar days and not specific dates for each activity. If the design schedule is changed, the Contractor shall submit a revised schedule reflecting the change within seven calendar days of the change.

#### 3.3.2.3 Procurement Activities

Tasks related to the procurement of long lead materials or equipment shall be included as separate activities in the project schedule. Long lead materials and equipment are those materials that have a procurement cycle of over 90 days. Examples of procurement process activities include, but are not limited to: submittals, approvals, procurement, fabrication, delivery, installation, start-up, and testing.

3.3.2.4 Government Activities

Government and other agency activities that could impact progress shall be shown. These activities include, but are not limited to: design reviews, submittal reviews, environmental permit approvals by State regulators, inspections, utility tie-in, Government Furnished Equipment (GFE) and notice to proceed for phasing requirements.

3.3.2.5 Responsibility

All activities shall be identified in the project schedule by the party responsible to perform the work. Responsibility includes, but is not limited to, the subcontracting firm, contractor work force, or government agency performing a given task. The responsible party for each activity shall be identified by the Responsibility Code.

3.3.2.6 Work Areas

All activities shall be identified in the project schedule by the work area in which the activity occurs. Activities shall not be allowed to cover more than one work area. The work area of each activity shall be identified by the Work Area Code.

3.3.2.7 Modification or Claim Number

Any activity that is added or changed by contract modification or used to justify claimed time shall be identified by a mod or claim code that changed the activity. Activities shall not belong to more than one modification or claim item. The modification or claim number of each activity shall be identified by the Mod or Claim Number

3.3.2.8 Bid Item

All activities shall be identified in the project schedule by the Contract Line Item to which the activity belongs. An activity shall not contain work in more than one line item. The line item for each appropriate activity shall be identified by the Bid Item Code.

3.3.2.9 Feature of Work

All activities shall be identified in the project schedule according to the feature of work to which the activity belongs. Feature of work refers, but is not limited to a work breakdown structure for the project. The feature of work for each activity shall be identified by the Feature of Work Code.

3.3.3 Scheduled Project Completion

The schedule interval shall extend from notice-to-proceed to the contract completion date.

3.3.3.1 Project Start Date

The schedule shall start no earlier than the date that the Notice to Proceed (NTP) was acknowledged. The Contractor shall include as the first

activity in the project schedule an activity called "Start Project". The "Start Project" activity shall have: an "ES" constraint, a constraint date equal to the date that the NTP was acknowledged, and a zero day duration.

#### 3.3.3.2 Constraint of Last Activity

Completion of the last activity in the schedule shall be constrained by the contract completion date. Calculation on project updates shall be such that if the early finish of the last activity falls after the contract completion date, then the float calculation shall reflect a negative float on the critical path. The Contractor shall include as the last activity in the project schedule an activity called "End Project". The "End Project" activity shall have: an "LF" constraint, a constraint date equal to the completion date for the project, and a zero day duration.

#### 3.3.3.3 Early Project Completion

In the event the project schedule shows completion of the project prior to the contract completion date, the Contractor shall identify those activities that have been accelerated and/or those activities that are scheduled in parallel to support the Contractor's "early" completion. Contractor shall specifically address each of the activities noted at every project schedule update period to assist the Contracting Officer in evaluating the Contractor's ability to actually complete prior to the contract period.

### 3.3.4 Interim Completion Dates

Contractually specified interim completion dates shall also be constrained to show negative float if the early finish date of the last activity in that phase falls after the interim completion date. The completion dates of each phase of the design-build contract shall be identified as interim completion dates on the Project Schedule.

### 3.3.5 Default Progress Data Disallowed

Actual Start and Finish dates shall not be automatically updated by default mechanisms that may be included in CPM scheduling software systems. Actual Start and Finish dates on the CPM schedule shall match those dates provided from Contractor Quality Control Reports. Failure of the Contractor to document the Actual Start and Finish dates on the Daily Quality Control report for every in-progress or completed activity and ensure that the data contained on the Daily Quality Control reports is the sole basis for schedule updating shall result in the disapproval of the Contractor's schedule and the inability of the Contracting Officer to evaluate Contractor progress for payment purposes.

### 3.3.6 Out-of-Sequence Progress

Activities that have posted progress without predecessors being completed (Out-of-Sequence Progress) will be allowed only on a case-by-case acceptance of the Contracting Officer. The Contracting Officer may direct that changes in schedule logic be made to correct any or all out-of-sequence work.

### 3.3.7 Extended Non-Work Periods

Designation of Holidays to account for non-work periods of over 5 days will not be allowed. Non-work periods of over 5 days shall be identified by addition of activities that represent the delays. Modifications to the logic of the project schedule shall be made to link those activities that may have been impacted by the delays to the newly added delay activities.

### 3.3.8 Negative Lags

Lag durations contained in the project schedule shall not have a negative value.

## 3.4 PROJECT SCHEDULE SUBMISSIONS

The Contractor shall provide the submissions as described below. The data disk, reports, and network diagrams required for each submission are contained in paragraph SUBMISSION REQUIREMENTS.

### 3.4.1 Preliminary Project Schedule Submission

The Preliminary Project Schedule, defining the Contractor's planned operations for the first 90 calendar days shall be submitted for approval within 30 calendar days after Notice to Proceed is acknowledged. The accepted preliminary schedule shall be used for payment purposes not to exceed 90 calendar days after Notice to Proceed.

### 3.4.2 Initial Project Schedule Submission

The Initial Project Schedule shall be submitted for acceptance within 60 calendar days after Notice to Proceed. The schedule shall provide a reasonable sequence of activities, which represent work through the entire project and shall be at a reasonable level of detail.

### 3.4.3 Periodic Schedule Updates

Based on the result of progress meetings, specified in "Periodic Progress Meetings," the Contractor shall submit periodic schedule updates. These submissions shall enable the Contracting Officer or to assess Contractor's progress. If the Contractor fails or refuses to furnish the information and project schedule data, which in the judgement of the Contracting Officer or authorized representative, is necessary for verifying the contractor's progress, the Contractor shall be deemed not to have provided an estimate upon which progress payment may be made.

### 3.4.4 Standard Activity Coding Dictionary

The Contractor shall submit, with the Initial Project Schedule, a coding scheme that shall be used throughout the project for all activity codes contained in the schedule. The coding scheme submitted shall list the values for each activity code category and translate those values into project specific designations. For example, a Responsibility Code Value, "ELE", may be identified as "Electrical Subcontractor." Activity code

values shall represent the same information throughout the duration of the contract. Once accepted with the Initial Project Schedule submission, changes to the activity coding scheme must be accepted by the Contracting Officer.

## 3.5 SUBMISSION REQUIREMENTS

The following items shall be submitted by the Contractor for the initial submission, and every periodic project schedule update throughout the life of the project:

### 3.5.1 Data Disks

Two data disks or two sets of data disks containing the project schedule shall be provided. Data on the disks shall be in the Standard Data Exchange Format (SDEF), in accordance with ER-1-1-11, PROGRESS, SCHEDULES, AND NETWORK ANALYSIS SYSTEMS, Appendix A, Standard Data Exchange Format Specification (attached at the end of this Project Schedule specification.

#### 3.5.1.1 File Medium

Required data shall be submitted on 3.5-inch disks, formatted to hold 1.44 MB of data, under the MS-Windows operating system.

#### 3.5.1.2 Disk Label

A permanent exterior label shall be affixed to each disk submitted. The label shall indicate the type of schedule (Initial, Update, or Change), full contract number, project name, project location, data date, name and telephone number or person responsible for the schedule, and the operating system and version used to format the disk.

#### 3.5.1.3 File Name

Each file submitted shall have a name related to either the schedule data date, project name, or contract number. The Contractor shall develop a naming convention that will ensure that the names of the files submitted are unique. The Contractor shall submit the file naming convention to the Contracting Officer for approval.

### 3.5.2 Narrative Report

A Narrative Report shall be provided with each update of the project schedule. This report shall be provided as the basis of the Contractor's progress payment request. The Narrative Report shall include: a description of activities along the critical path(s), a description of current and anticipated problem areas or delaying factors and their impact, and an explanation of corrective actions taken.

### 3.5.3 Accepted Changes Verification

Only project schedule changes that have been previously accepted by the Contracting Officer shall be included in the schedule submission. The Narrative Report shall specifically reference, on an activity by activity

basis, all changes made since the previous period and relate each change to documented, accepted schedule changes.

3.5.4 Schedule Reports

The format for each activity for the schedule reports listed below shall contain: Activity Numbers, Activity Description, Original Duration, Remaining Duration, Early Start Date, Early Finish Date, Late Start Date, Late Finish Date, Total Float. Actual Start and Actual Finish Dates shall be printed for those activities in progress or completed.

3.5.4.1 Activity Report

A list of all activities sorted according to activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.2 Logic Report

A list of Preceding and Succeeding activities for every activity in ascending order by activity number and then sorted according to Early Start Date. For completed activities the Actual Start Date shall be used as the secondary sort.

3.5.4.3 Total Float Report

A list of all activities sorted in ascending order of total float. Activities that have the same amount of total float shall be listed in ascending order of Early Start Dates.

3.5.4.4 Earnings Report

A compilation of the Contractor's Total Earnings on the project from the Notice to Proceed until the most recent Monthly Progress Meeting. This report shall reflect the Earnings of specific activities based on the agreements made in the field and approved between the Contractor and Contracting Officer at the most recent Monthly Progress Meeting. Provided that the Contractor has provided a complete schedule update, this report shall serve as the basis of determining Contractor Payment. Activities shall be grouped by bid item and sorted by activity numbers. This report shall: sum all activities in a bid item and provide a bid item percent; and complete and sum all bid items to provide a total project percent complete. The printed report shall contain, for each activity: Activity Number, Activity Description, Original Budgeted Amount, Total Quantity, Quantity to Date, Percent Complete (based on cost), Earnings to Date.

3.5.5 Network Diagram

The network diagram shall be required on the initial schedule submission, on monthly schedule update submissions, or whenever any logic changes have occurred, to include addition or deletion of activities due to modifications to the project. The network diagram shall depict and display the order and interdependence of activities and the sequence in which the work is to be accomplished. The activity or event number, description,

duration, and estimated earned value shall be shown on the diagram. The Contracting Officer will use, but is not limited to, the following conditions to review compliance with this paragraph:

3.5.5.1 Continuous Flow

Diagrams shall show a continuous flow from left to right with no arrows from right to left. The activity or event number, description, duration, and estimated earned value shall be shown on the diagram.

3.5.5.2 Project Milestone Dates

Dates shall be shown on the diagram for start of project, any contract required interim completion dates, and contract completion dates.

3.5.5.3 Critical Path

The critical path shall be clearly shown.

3.5.5.4 Banding

Activities shall be grouped to assist in the understanding of the activity sequence. Typically, this flow will group activities by work area and/or responsibility.

3.5.5.5 S-Curves

A graph of anticipated earnings (S-Curves) showing cumulative for the duration of the project. The vertical scale shall show earnings/percent complete from 0%-100%. The horizontal scale shall be a time scale showing the calendar months of the project. Three curves shall be plotted on the same graph; the earnings/percent complete based on early finish dates; the earnings/percent complete based on late finish dates; the actual earnings/percent complete to date.

3.5.5.6 Bar Chart

A bar chart covering the previous month's activities and progress, and the planned activities over 3 months projected into the future. The chart shall also include actual and anticipated earnings.

3.6 PERIODIC PROGRESS MEETINGS

Progress meetings to discuss payment shall include a monthly onsite meeting or other regular intervals mutually agreed to at the preconstruction conference. During this meeting the Contractor shall describe, on an activity by activity basis, all proposed revisions and adjustments to the project schedule required to reflect the current status of the project. The Contracting Officer will accept activity progress, proposed revisions, and adjustments as appropriate.

3.6.1 Meeting Attendance

The Contractor's Project Manager and Scheduler shall attend the regular

progress meeting.

### 3.6.2 Update Submission Following Progress Meeting

A complete update of the project schedule containing all accepted progress, revisions, and adjustments, based on the regular progress meeting, shall be submitted not later than 4 working days after the monthly progress meeting.

### 3.6.3 Progress Meeting Contents

Update information, including Actual Start Dates, Actual Finish Dates, Remaining Durations, and Cost-to-Date shall be subject to the approval of the Contracting Officer. The following is a minimum set of items that the Contractor shall address, on an activity by activity basis, during each progress meeting.

#### 3.6.3.1 Start and Finish Dates

The Actual Start and Actual Finish dates for each activity currently in-progress or completed activities.

#### 3.6.3.2 Time Completion

The estimated Remaining Duration for each activity in-progress. Time-based progress calculations must be based on Remaining Duration for each activity.

#### 3.6.3.3 Cost Completion

The earnings for each activity started. Payment will be based on earnings for each in-progress or completed activity. Payment for individual activities will not be made for work that contains quality defects. A portion of the overall project amount may be retained based on delays of activities.

#### 3.6.3.4 Logic Changes

All logic changes pertaining to Notice to Proceed on change orders, change orders to be incorporated into the schedule, contractor proposed changes in work sequence, corrections to schedule logic for out-of-sequence progress, lag durations, and other changes that have been made pursuant to contract provisions shall be specifically identified and discussed.

#### 3.6.3.5 Other Changes

Other changes required due to delays in completion of any activity or group of activities include: 1) delays beyond the Contractor's control, such as strikes and unusual weather. 2) delays encountered due to submittals, Government Activities, deliveries or work stoppages which make re-planning the work necessary, and 3) a schedule which does not represent the actual prosecution and progress of the work.

## 3.7 REQUESTS FOR TIME EXTENSIONS

In the event the Contractor requests an extension of the completion date, he shall furnish such justification, project schedule data and supporting evidence as the Contracting Officer may deem necessary for a determination as to whether or not the Contractor is entitled to an extension of time under the provisions of the contract. Submission of proof of delay, based on revised activity logic, duration, and costs (updated to the specific date that the delay occurred) is obligatory to any acceptance.

### 3.7.1 Justification of Delay

The project schedule shall clearly display that the Contractor has used, in full, all the float time available for the work involved with this request. The Contracting Officer's determination as to the number of allowable days of time extension shall be based upon the project schedule updates in effect for the time period in question, and other factual information. Actual delays that are found to be caused by the Contractor's own actions, which result in the extension of the schedule, will not be a cause for a time extension to the project completion date.

### 3.7.2 Submission Requirements

The Contractor shall submit a justification for each request for a change in the project completion date of under 2 weeks based upon the most recent schedule update at the time of the Notice to Proceed or constructive direction issued for the change. Such a request shall be in accordance with the requirements of other appropriate Contract Clauses and shall include, as a minimum:

a. A list of affected activities, with their associated project schedule activity number.

b. A brief explanation of the causes of the change.

c. An analysis of the overall impact of the changes proposed.

d. A sub-network of the affected area.

Activities impacted in each justification for change shall be identified by a unique activity code contained in the required data file.

### 3.7.3 Additional Submission Requirements

For any requested time extension of over 2 weeks, the Contracting Officer may request an interim update with revised activities for a specific change request. The Contractor shall provide this disk within 4 days of the Contracting Officer's request.

## 3.8 DIRECTED CHANGES

If Notice to Proceed (NTP) is issued for changes prior to settlement of price and/or time, the Contractor shall submit proposed schedule revisions to the Contracting Officer within 2 weeks of the NTP being issued. The proposed revisions to the schedule will be accepted by the Contracting Officer prior to inclusion of those changes within the project schedule.

If the Contractor fails to submit the proposed revisions, the Contracting Officer may furnish the Contractor suggested revisions to the project schedule. The Contractor shall include these revisions in the project schedule until revisions are submitted, and final changes and impacts have been negotiated. If the Contractor has any objections to the revisions furnished by the Contracting Officer, the Contractor shall advise the Contracting Officer within 2 weeks of receipt of the revisions. Regardless of the objections, the Contractor shall continue to update the schedule with the Contracting Officer's revisions until a mutual agreement in the revisions is reached. If the Contractor fails to submit alternative revisions within 2 weeks of receipt of the Contracting Officer's proposed revisions, the Contractor will be deemed to have concurred with the Contracting Officer's proposed revisions. The proposed revisions will then be the basis for an equitable adjustment for performance of the work.

## 3.9 OWNERSHIP OF FLOAT

Float available in the schedule, at any time, shall not be considered for the exclusive use of either the Government or the Contractor.

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SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SUBMITTAL IDENTIFICATION

Submittals required are identified by SD numbers and titles as follows:

SD-01 Preconstruction Submittals

SD-02 Shop Drawings

SD-03 Product Data

SD-04 Samples

SD-05 Design Data

SD-06 Test Reports

SD-07 Certificates

SD-08 Manufacturer's Instructions

SD-09 Manufacturer's Field Reports

SD-10 Operation and Maintenance Data

SD-11 Closeout Submittals

1.2 SUBMITTAL CLASSIFICATION

Submittals are classified as follows:

1.2.1 Government Approved/Accepted

Governmental approval/acceptance is required for any deviations from the Solicitation or Accepted Proposal and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", they are considered to be "shop drawings". The Contractor shall provide the Government with six (6) copies of all Government Approved/Accepted construction submittals.

1.2.2 Information Only

All submittals not requiring Government acceptance/approval will be for information only. They are not considered to be "shop drawings" within the terms of the Contract Clause referred to above. The Contractor shall

provide the Government with four (4) copies of all Information Only submittals.

## 1.3 GOVERNMENT RESPONSIBILITY

### 1.3.1 Extensions of Design

Government review is required for extensions of design construction submittals used to define contract conformity, and for deviation from the completed design. Review will be only for conformance with the contract requirements. Included are only those construction submittals for which the Designer of Record design documents do not include enough detail to ascertain contract compliance. Government review is not required for extensions of design such as structural steel or reinforcement shop drawings.

### 1.3.2 Government Accepted/Approved Submittals

The Contracting Officer's conformance review or approval of submittals shall not be construed as a complete check, but will indicate only that the design, general method of construction, materials, detailing and other information appear to meet the Solicitation and Accepted Proposal. Government review or approval will not relieve the Contractor of the responsibility for any errors that may exist. The Contractor, under the Design and CQC requirements of this contract, is responsible for the design, dimensions, all design extensions, such as the design of adequate connections and details, etc., and the satisfactory construction of all work. After submittals have been reviewed for conformance or accepted/approved, as applicable, by the Contracting Officer, no resubmittal for the purpose of substituting materials or equipment will be considered unless accompanied by an explanation of why a substitution is necessary.

## 1.4 CONTRACTOR RESPONSIBILITY

### 1.4.1 Designer of Record

The Designer of Record shall approve all extensions of design, critical materials, any deviations from the solicitation, the accepted proposal, the completed design, equipment whose compatibility with the entire system must be checked, and other items as designated by the Contracting Officer. Within the terms of the Contract Clause entitled "Specifications and Drawings for Construction", these are considered to be "shop drawings". The Government may review Designer of Record approved submittals for conformance to the Solicitation and Accepted Proposal. The Government will review all submittals designated as deviating from the Solicitation or Accepted Proposal, as described below.

### 1.4.2 Disapproved Submittals

The Contractor shall make all corrections required by the Contracting Officer, obtain the Designer of Record's approval, when applicable, and promptly furnish a corrected submittal in the form and number of copies specified for the initial submittal. Any "information only" submittal

found to contain errors or unapproved deviations from the Solicitation or Accepted Proposal shall be resubmitted as one requiring "approval" action, requiring both Designer of Record and Government acceptance/approval. If the Contractor considers any correction indicated by the Government on the submittals to constitute a change to the contract, it shall promptly provide a notice in accordance with the Contract Clause "Changes" to the Contracting Officer.

## 1.5 WITHHOLDING OF PAYMENT

No payment for materials incorporated in the work will be made if all required Designer of Record or Government acceptances/approvals have not been obtained. No payment will be made for any materials incorporated into the work for any conformance review submittals or information only submittals found to contain errors or deviations from the Solicitation or Accepted Proposal.

## 1.6 SUBMITTALS

Government acceptance/approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with this section:

SD-01 Preconstruction Submittals

Submittal Register (ENG Form 4288); G.
Monthly Updates (ENG Form 4288)

Four copies of the completed ENG Form 4288.

One copy of the monthly update shall be submitted together with the monthly progress payment request.

# PART 2 PRODUCTS (Not Applicable)

# PART 3 EXECUTION

## 3.1 GENERAL

The Contractor shall make submittals as required by the specifications. The Contracting Officer may request submittals in addition to those specified when deemed necessary to adequately describe the work covered in the respective sections. Units of weights and measures used on all submittals shall be the same as those used in the contract drawings. Each submittal shall be complete and in sufficient detail to allow ready determination of compliance with contract requirements. Prior to submittal, all items shall be checked and approved by the Contractor's Quality Control (CQC) System Manager and each item shall be stamped, signed, and dated by the CQC System Manager indicating action taken. Proposed deviations from the contract requirements shall be clearly identified. Submittals shall include items such as: Contractor's, manufacturer's, or fabricator's drawings; descriptive literature including (but not limited to) catalog cuts, diagrams, operating charts or curves; test reports; test cylinders; samples; O&M manuals (including parts list);

certifications; warranties; and other such required submittals. Submittals requiring Government acceptance/approval shall be scheduled and made prior to the acquisition of the material or equipment covered thereby. Samples remaining upon completion of the work shall be picked up and disposed of in accordance with manufacturer's Material Safety Data Sheets (MSDS) and in compliance with existing laws and regulations.

### 3.1.1 Design Submittals

The Contractor shall provide design submittals in accordance with Section 01012 entitled "DESIGN AFTER AWARD".

## 3.2 SUBMITTAL REGISTER (ENG FORM 4288)

The Designers of Record shall develop a complete list of submittals required during the design and construction phases of the contract. The Contractor shall develop a Submittal Register, ENG Form 4288, from this list, including any other submittals that may be required by other parts of the contract. The Contractor shall use the government-provided software, QCS (see Section 01312), to create the ENG Form 4288. The completed Submittal Register shall be submitted to the Contracting Officer for approval within 15 calendar days after Notice to Proceed with the design phase. The submit dates and need dates in the submittal register shall be coordinated with the dates in the Contractor's progress schedule. Updates to the submittal register showing the Contractor action codes and actual submittal dates with Government action codes and action dates shall be submitted monthly together with the monthly payment request, or until all submittals have been satisfactorily completed. When the progress schedule is revised, the submittal register shall also be revised and both resubmitted for approval. The approved submittal register will serve as a scheduling document for submittals and will be used to control submittal actions throughout the contract period.

## 3.3 SCHEDULING

Submittals covering component items forming a system or items that are interrelated shall be scheduled to be coordinated and submitted concurrently. Certifications to be submitted with the pertinent drawings shall be so scheduled. Adequate time (for design submittals, see Section 01012; for construction submittals, a minimum of 30 calendar days exclusive of mailing time) shall be allowed and shown on the register for review and approval by the Government. No delay damages or time extensions will be allowed for time lost in incorrect, incomplete and/or late submittals. An additional 15 calendar days shall be allowed and shown on the register for review and approval of submittals for food service equipment and refrigeration and HVAC control systems.

## 3.4 TRANSMITTAL FORM (ENG FORM 4025)

A transmittal form (ENG Form 4025) shall be used for submitting both Government approved and information only submittals. The Contractor shall use the government-provided software, QCS (see Section 01312), to create the ENG Form 4025. A separate transmittal form shall be used for each specification section. This form shall be properly completed by filling

out all the heading blank spaces and identifying each item submitted. Special care shall be exercised to ensure proper listing of the specification paragraph and/or sheet number of the contract drawings pertinent to the data submitted for each item.

## 3.5 SUBMITTAL PROCEDURE

Submittals shall be made as follows:

### 3.5.1 Procedures

Submittals to the Contracting Officer are required in the number of copies identified in paragraph 1.2 and shall be submitted as follows:

U.S. Army Corps of Engineer District, Honolulu
Fort Shafter Resident Office
Bldg 230
Fort Shafter, Hawaii 96858-5440

### 3.5.2 Deviations

a. For submittals that include proposed deviations requested by the Contractor, the column "variation" on ENG Form 4025 shall be checked. The Contractor shall set forth in writing the reason for any deviations and annotate such deviations on the submittal. The Contractor's Designer of Record approval is required for any proposed deviations. The Government reserves the right to rescind inadvertent approval of submittals containing unnoted deviations.

b. In cases where "trade names or equal" are used in the plans and/or Technical Specifications, any "equal" substitution by the Contractor is considered a variance and will require the Government's approval. Approval action by the Contracting Officer will not relieve the Contractor of his quality control responsibility and compliance with the contract, except for those specific portions of the submittal which clearly highlight the departures from the contract, and which are brought to the attention of the Government. The Contractor shall be responsible for all corrective actions, when submittals containing provisions of non-compliance with the contract are not specifically brought to the Government's attention. Any associated cost or time loss from such corrective actions shall not be made subject to a claim against the Government.

c. Variations from the contract requirements may require an appropriate contract modification prior to acceptance by the Government; however, such pending action shall not be a basis of claim for time or additional cost against the Government, since the Contractor still has the option to comply with the original contract requirements. If the variation is of a minor nature and does not affect a change in cost or time of performance, a modification may not be issued. All variations shall meet the standards set by the contract documents.

## 3.6 COORDINATION OF LAYOUTS

The Contractor Quality Control (CQC) organization is responsible for insuring that the shop drawings and submittals of the different trades are coordinated in order that space conflicts during installation/construction of mechanical, electrical, architectural, civil, structural and other items of work are avoided. The Contractor shall be required to prepare/develop coordinated working layout drawings prior to commencement of any feature of work, at any contractor tier, unless otherwise directed by the Contracting Officer. These layout drawings shall be reviewed and certified by the CQC organization prior to the start of work in any area. The CQC shall insure that layout drawings indicate all necessary features of work, providing for a coordinated arrangement of the various installations, giving full consideration for access to installed equipment/systems and the future maintenance of these items. Interference between equipment and systems or construction materials which cannot be resolved between Contractor and subcontracting tiers shall be resolved by the Contracting Officer at no additional cost to the Government, if it is determined that adequate space was available and installations could have been accommodated within the designated construction area through properly coordinated layout drawings. One (1) CQC certified copy of all layout drawings shall be available for Government's review five (5) working days prior to scheduled commencement of the work. Submission shall be made upon Government's request.

## 3.7 CONTROL OF SUBMITTALS

The Contractor shall carefully control his procurement operations to ensure that each individual submittal is made on or before the Contractor scheduled submittal date shown on the approved "Submittal Register."

## 3.8 GOVERNMENT ACCEPTED/APPROVED SUBMITTALS

Upon completion of review of submittals requiring Government approval, the submittals will be identified as having received approval by being so stamped and dated. The Contracting Officer will retain four (4) copies of the submittal and two (2) copies of the submittal will be returned to the Contractor. If the Government performs a conformance review of other Designer of Record approved submittals, the submittals will be so identified and returned, as described above.

## 3.9 INFORMATION ONLY SUBMITTALS

Submittals provided For Information Only (FIO) to the Government shall be submitted in four (4) copies, including resubmittals. Normally submittals for information only will not be returned. Approval of the Contracting Officer is not required on information only submittals. The Government reserves the right to require the Contractor to resubmit any item found not to comply with the contract. This does not relieve the Contractor from the obligation to furnish material conforming to the plans and specifications; will not prevent the Contracting Officer from requiring removal and replacement of nonconforming material incorporated in the work; and does not relieve the Contractor of the requirement to furnish samples for testing by the Government laboratory or for check testing by the Government in those instances where the technical specifications so prescribe.

3.10 STAMPS

Stamps used by the Contractor on the submittal data to certify that the submittal meets contract requirements shall be similar to the following:

```
_____________________________________________________________________
|                              CONTRACTOR                             |
|                                                                     |
|                              (Firm Name)                            |
|                                                                     |
|                                                                     |
|                                                                     |
| _____ Approved                                                      |
|                                                                     |
|                                                                     |
| _____ Approved with corrections as noted on submittal data and/or   |
| attached sheets(s).                                                 |
|                                                                     |
|                                                                     |
|                                                                     |
| SIGNATURE:  ____________________________________________________ |
|                                                                     |
| TITLE:  (DESIGNER OF RECORD)                                        |
|                                                                     |
| DATE:  ________________________________________________________ |
|                                                                     |
|_____________________________________________________________________|
```

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SECTION 01312

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SECTION 01312

CONTRACTOR QUALITY CONTROL

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM D 3740 | (1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction |
| ASTM E 329 | (1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G.

### 1.3 PAYMENT

Separate payment will not be made for providing and maintaining an effective Quality Control system, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

### 3.1 GENERAL

The Contractor is responsible for quality control and shall establish and maintain an effective quality control system in compliance with the Contract Clause titled, "Inspection of Construction." The quality control

system shall consist of plans, procedures, and the organization necessary to produce an end product that complies with the contract requirements. The system shall cover all design and construction operations, both onsite and offsite, and shall be keyed to the proposed design and construction sequence.

The Project Manager will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The Project Manager in this context shall mean the individual with the responsibility for the overall management of the project, including design, construction, quality, and production.

## 3.2 QUALITY CONTROL PLAN

### 3.2.1 Contractor Quality Control

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of Notice to Proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 90 days of operation. Design and construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

### 3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all design and construction operations, both onsite and offsite, including work by subcontractors, designers of record, consultants, architect/engineers (A/E), fabricators, suppliers, and purchasing agents:

a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the construction work specified. The staff shall include a CQC System Manager who shall report to the Project Manager or someone higher in the Contractor's organization.

b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC function. Technicians responsible for sampling and testing of concrete shall be certified by the American Concrete Institute (ACI) or the Concrete Technicians Association of Hawaii (CTAH). Proof of certification shall be included in the quality control Plan. Personnel qualifications may be furnished incrementally as the work progresses, but in no case, less than fourteen (14) calendar days before personnel are required on the job.

c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.

d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, designers of record, consultants, A/E's, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330, SUBMITTAL PROCEDURES, or Section 01012, DESIGN AFTER AWARD, as applicable.

e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test.

f. For all proposed QC materials testing laboratories the contractor must submit a current HED or MTC letter of validation.

g. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentation.

h. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.

i. Reporting procedures, including proposed reporting formats.

j. A list of the definable features of work. A definable feature of work is a task that is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Additional Requirements for the Design Quality Control (DQC) Plan

The Contractor's DQC Plan shall provide and maintain an effective quality control program which will assure that all services required by this design-build contract are performed and provided in a manner that meets professional architectural and engineering quality standards. As a minimum, competent, independent reviewers identified in the DQC Plan shall technically review all documents. The same element that produced the

product shall not perform the independent technical review (ITR). The Contractor shall correct errors and deficiencies in the design documents prior to submitting them to the Government.

The Contractor shall include the design schedule in the master project schedule, showing the sequence of events involved in carrying out the project tasks within the specific contract period. This should be at a detailed level of scheduling sufficient to identify all major design tasks, including those that control the flow of work. The schedule shall include review and correction periods associated with each item. This should be a forward planning as well as a project-monitoring tool. The schedule reflects calendar days and not dates for each activity. If the schedule is changed, the Contractor shall submit a revised schedule reflecting the change within seven (7) calendar days. The Contractor shall include in the DQC Plan the discipline-specific checklists to be used during the design and quality control of each submittal. These completed checklists shall be submitted at each design phase as part of the project documentation. Example checklists can be found in ER 1110-1-12.

A Design Quality Control Manager who has the responsibility of being cognizant of, and assuring that all documents on the project have been coordinated, shall implement the DQC Plan. This individual shall be a person who has verifiable engineering or architectural design experience and is a registered professional engineer or architect. The Contractor shall notify the Contracting Officer, in writing, of the name of the individual, and the name of an alternate person assigned to the position.

The Contracting Officer will notify the Contractor, in writing, of the acceptance of the DQC Plan. After acceptance, any changes proposed by the Contractor are subject to the acceptance of the Contracting Officer.

### 3.2.4 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of design and/or construction. Acceptance is conditional and will be predicated on satisfactory performance during the design and construction phases. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

### 3.2.5 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing a minimum of seven calendar days prior to any of any proposed change. Proposed changes shall not be implemented prior to its acceptance by the Contracting Officer.

## 3.3 COORDINATION MEETINGS

After the Pre-design Conference and before the start of design and/or construction, and prior to acceptance by the Government of the Quality Control Plan, a Quality Control Coordination Meeting shall be held. The Contractor shall meet with the Contracting Officer or Authorized Representative to discuss the Contractor's quality control system. The CQC

Plan shall be submitted for review a minimum of [7] calendar days prior to the Coordination Meeting. During this meeting, a mutual understanding of the CQC system details shall be developed, including the forms for recording the CQC operations, design activities, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's management and control with the Government's Quality Assurance. Minutes of the meeting will be prepared by the Government and signed by both the Contractor and the Contracting Officer's Representative. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures that may require corrective action by the Contractor.

## 3.4 QUALITY CONTROL ORGANIZATION

### 3.4.1 Personnel Requirements

The requirements for the CQC organization are a CQC System Manager (CQCSM), a Design Quality Manager, and a sufficient number of additional qualified personnel to ensure contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as par of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer.

The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

### 3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC on the contract and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a graduate engineer, graduate architect, or a graduate of construction management with a minimum of 5 years construction experience on construction similar to this contract. The CQC System Manager, or an acceptable, qualified representative, shall be on site at all times during design and construction activities and shall be employed by the prime Contractor. The CQC System Manager shall be assigned no other duties. An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirements for the alternate shall be

the same as the designated CQC System Manager.

3.4.3 CQC Personnel (Construction)

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager in the areas listed below. Unless otherwise stated, these individuals, when required, may be employees of the prime or subcontractor; shall be responsible to the CQC System Manager; be physically present at the construction site during work on their areas of responsibility; have the necessary education and/or experience in accordance with the experience matrix listed herein. These individuals may perform other duties but must be allowed sufficient time to perform their assigned quality control duties as described in the Quality Control Plan.

EXPERIENCE MATRIX

| | Area | Qualifications |
|---|---|---|
| a. | Civil | Graduate Civil Engineer with 2 years experience in the type of work being performed on this project or technician with 5 years related experience |
| b. | Mechanical | Graduate Mechanical Engineer with 2 years experience or technician with 5 years related experience |
| c. | Electrical | Graduate Electrical Engineer with 2 years related experience or technician with 5 years related experience |
| d. | Structural | Graduate Structural Engineer with 2 years experience or person with 5 years related experience |
| e. | Architectural | Graduate Architect with 2 years experience or person with 5 years related experience |
| f. | Environmental Specialist | Graduate Environmental Engineer with 3 years experience |
| g. | Submittals | Submittal Clerk with 1 year experience |
| h. | Occupied family housing | Person, customer relations type, coordinator experience |
| h. | Concrete, Pavements and Soils | Materials Technician with 2 years experience for the appropriate area |

If it is subsequently determined by the Contracting Officer that the minimum contract CQC requirements are not being met, the Contractor may be

required to provide additional staff personnel to the CQC organization at no cost to the Government.

### 3.4.4 Additional Requirement

In addition to the above experience and/or education requirements, the CQC System Manager and any alternates shall have completed the course entitled "Construction Quality Management For Contractors" within the past 5 years. This course is periodically offered at the General Contractors Association of Hawaii.

### 3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance. Requests shall include the names, qualifications, duties, and responsibilities of each proposed replacement. Upon acceptance of any changes, the Contractor shall revise the CQC plan to accurately reflect the changes. The CQC plan shall be kept current at all times during the life of the contract.

## 3.5 SUBMITTALS AND DELIVERABLES

Design submittals shall be made as required in Section 01012, DESIGN AFTER AWARD. Construction submittals shall be made as specified in Section 01330, SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 15950A, Heating, Ventilating and Air Conditioning (HVAC) Control Systems; Section 15951A, Direct Digital Control for HVAC; Section 15990A, Testing, Adjusting, and Balancing of HVAC Systems; or Section 15995A, Commissioning of HVAC Systems, are included in the contract, the submittals required by those sections shall be coordinated with Section 01330, Submittal Procedures, to ensure adequate time is allowed for each type of submittal required.

## 3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the design and construction, to include that of designers of record, consultants, subcontractors and suppliers, comply with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work (construction) as follows:

### 3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

a. A review of each paragraph of applicable specifications.

b. A review of the contract drawings.

c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.

d. Review of provisions that have been made to provide required control inspection and testing.

e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.

f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.

g. A review of the appropriate activity hazard analysis to assure safety requirements are met.

h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.

i. A check to ensure that the Contracting Officer has accepted the portion of the plan for the work to be performed.

j. Discussion of the initial control phase.

k. The Government shall be notified at least 2 workdays in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.

b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.

c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.

d. Resolve all differences.

e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.

f. The Government shall be notified at least 1 workday in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.

g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

### 3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work that may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

### 3.6.3 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

## 3.7 TESTS

### 3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product that conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall obtain the services of an industry-recognized testing laboratory approved by the Honolulu Engineer District (HED), or may establish a testing laboratory at the project site acceptable to the Contracting Officer. No approved Contractor's Quality Control (CQC) laboratory may act as both CQC materials testing laboratory and the Government's Quality Assurance (QA) laboratory on the same project. Additionally, tests contractually required to be performed by an industry-recognized testing laboratory shall not be accomplished by the Contractor-established on-site laboratory.

The Contractor's testing procedures shall include the following activities and shall record and provide the following data:

a. Verify that testing procedures comply with contract requirements.

b. Verify that facilities and testing equipment are available and comply with testing standards.

c. Check test instrument calibration data against certified standards.

d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.

e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 Validation Requirements

Any laboratory used by the Contractor for testing aggregate, concrete, bituminous materials, soils, rock, and other construction materials must possess a current validation letter prior to performance of testing by that laboratory. Validation shall be obtained through the Corps of Engineers Materials Testing Center (MTC) in Vicksburg, MS. Validation may be initiated by completing an Inspection Request Form and questionnaire that are available directly from the MTC or from the MTC website, http://www.wes.army.mil/SL/MTC/inspection.htm.

The MTC also maintains a website listing validated laboratories at: http://www.wes.army.mil/SL/MTC/ValStatesTbl.htm.

3.7.2.2 Exception

The validation letters already obtained from HED in 2001 and 2002 will be considered acceptable proof of validation through its expiration date. Upon expiration, laboratories must be revalidated by the MTC, as required above. The validation status of laboratories in Hawaii may be found at: http://www.poh.usace.army.mil/Construction/LabValidation/labvalidation.html.

3.7.3 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the

contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

### 3.7.4 Capability Recheck

If the selected laboratory fails the capability check, the Contractor shall reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

### 3.7.5 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make quality assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

### 3.7.6 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. *Samples of materials for test verification and acceptance testing by the Government shall be delivered to a testing laboratory on the Island of Oahu, State of Hawaii, designated by the Contracting Officer. Coordination for each specific test, exact delivery location, and dates will be made through the Government field office.

## 3.8 COMPLETION INSPECTION

### 3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

### 3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. The CQC System Manager shall develop a punch list of items that do not conform to the contract documents. The Government will review the punch list and add to or correct the items listed. The CQC System Manager shall incorporate Government comments and provide a Pre-Final Punch List. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the

Government to schedule a Final inspection with the customer. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

### 3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The Contractor shall notify the Contracting Officer at least 14 days prior to the proposed final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work to be performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

### 3.8.4 Post Completion Feedback Meeting and Preparation of Written Minutes

At the completion of this project, the CQC Systems Manager will host a meeting to review the project and to discuss lessons learned during the design and construction of the project. This meeting should be scheduled for 4 hours on-site and should be attended by the Project Manager and representatives of the designers of record, consultants, and major subcontractors, including mechanical and electrical. The Contracting Officer will invite members of the design team to participate in this meeting. Minutes of the meeting shall be prepared by the CQC System Manager and submitted to the Government.

## 3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be prepared using government-provided software, QCS (see Section 01312 ), that includes, as a minimum, the following information:

a. Contractor/subcontractor and their area of responsibility.

b. Operating plant/equipment with hours worked, idle, or down for repair.

c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of

work performed each day by NAS activity number.

d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.

e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/ drawings requirements.

f. Submittals reviewed, with contract reference, by whom, and action taken.

g. Off-site surveillance activities, including actions taken.

h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.

i. Instructions given/received and conflicts in plans and/or specifications.

j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Unless otherwise directed by the Contracting Officer the original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days, beginning with the construction NTP, shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

## 3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages by the Contractor.

-- End of Section --

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SECTION 01900

MISCELLANEOUS PROVISIONS

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

| | |
|---|---|
| ASTM A 240 | (1993) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA) |
| 24 CFR 35 | Lead-Based Paint Poisoning Prevention in Certain Residential Structures |
| 29 CFR 1910.1001 | Asbestos, Tremolite, Anthophyllite, and Actinolite |
| 29 CFR 1926.1101 | Asbestos, Tremolite, Anthophyllite, Actinolite |
| 40 CFR 763 | Asbestos |
| 40 CFR 745 | Lead; Requirements for Lead-Based Paint Activities |

### 1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Pre-Construction Submittals

Organization Plan; G.

Provide a diagram depicting the proposed management organization. The chart shall clearly identify lines of authority and areas of responsibility. Include a narrative description of how the management team will operate, and the specific duties and responsibilities of the key individuals.

The narrative shall describe the Offeror's proposed on-site organization and structure, and shall describe how the Offeror intends to monitor and control timeliness, quality, and safety of

the work at the job site, including the work of any subcontractors on all phases of the contract.

Identify the individuals proposed to fill the key management positions: Project Manager, Project Superintendent, Contractor Quality Control System Manager, Design Quality Control Manager, Safety and Health Manager. Provide resumes for each individual. Resumes must support the individual’s qualifications to perform in the selected position.

Provide copies of letters of direction to each key personnel from an appropriate officer of the company.

If the information submitted in proposal Volume I, Factor III is current and complete, submit one copy of this information. However, if any of the proposal information is not current or requires revision, in addition to the copy of the proposal information, submit four copies of all additions and changes for Contracting Officer acceptance.

Accident Prevention Plan. G.

Activity Hazard Analyses, G.

SD-03 Product Data

Equipment Data.

A list of all equipment furnished under this contract. This list shall include, but not be limited to, each piece of equipment with a serial number, and shall include all information shown on the manufacturer's nameplate, so as to positively identify the piece of equipment. This list shall also include the cost of each piece of equipment (less installation costs) F.O.B. construction site. This list shall be furnished as soon as possible after equipment is purchased. The list shall consist of one (1) reproducible and three (3) copies, and shall be furnished to the Contracting Officer not later than thirty (30) calendar days prior to completion of any segment of the contract work that has an incremental completion date.

Recovered Material Report

The Contractor shall provide a report listing all products meeting EPA guidelines for products containing recovered materials and quantity used for this project.

SD-06 Test Reports

Inspection of Existing Conditions.

A written report with color photographs noting the condition of the existing facilities at the time of the inspection. One copy of the report including photographs shall be submitted to the Contracting Officer, prior to construction.

SD-06 Test Records

Dust Control; G.

Method(s) of dust control.

Excavation/Trenching Clearance.

Prior to start of any excavation or trenching work, the Contractor shall obtain clearance, in writing, from the appropriate communications agency and base or area engineer. Copies of all correspondence shall be provided the Contracting Officer. Normal coordination time for obtaining the necessary permits is approximately fifteen (15) calendar days. The Contractor shall advise the Contracting Officer promptly when it appears that the normal coordination time will be exceeded.

Condition of Contractor's Operation or Storage Area.

The Contractor shall submit to the Contracting Officer photographs and/or videos depicting the condition of the Contractor's Operation or Storage Area.

SD-07 Certificate

Products Containing Recovered Materials.

The Contractor shall submit manufacturer's certification attesting that product meets or exceeds EPA's recovered material guidelines.

## 1.3 PROJECT MANAGEMENT ORGANIZATION

### 1.3.1 General

The Contractor is responsible for ensuring that the contract is adequately staffed to manage all of the work in full accordance and compliance with the contract requirements.

### 1.3.2 Organization Plan

The contractor shall submit an organization plan describing the organization it intends to structure for managing this contract. The plan shall include lines of authority, position responsibilities, and qualifications of the proposed staff. The project staff shall minimally consist of the following key personnel: Project Manager, Project Superintendent, Contractor Quality Control System Manager, Design Quality Control Manager, Safety and Health Manager. Each of the individuals selected to fill these positions is subject to acceptance by the Contracting Officer.

### 1.3.3 Organizational Changes

The Contractor shall maintain the project management staff at full strength at all times. When it is necessary to make changes to the staff, the Contractor shall revise the Organization Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance at least fourteen (14) calendar days prior to implementation of the changes.

Substitutions for any accepted key personnel must be submitted for review and acceptance by the Contracting Officer prior to the start of work by that individual. The Contractor is informed that the Government will be allowed at least 30 days to respond. Any delays resulting from this process shall be the responsibility of the contractor and shall not be a basis for any equitable contract adjustment.

1.3.4 Project Manager

The Project Manager shall be responsible for the contractor's overall management and coordination of this contract and shall be the central point of contact with the Government for performance of all work under this contract including warranty. The Project Manager shall oversee construction accomplishment, administer all instructions, and answer all questions from the Contracting Officer pertaining to the work during the life of the contract, including the warranty period. The Project Manager shall be responsible for the complete coordination of all work in this contract. The Project Manager will be responsible for ensuring that adequate internal controls and review procedures are followed in order to eliminate conflicts, errors and omissions, and for ensuring that all technical requirements are met. Another individual may be designated to temporarily act for the Project Manager, however, forty-eight (48) hours advance notice in writing of such change shall be requested to the Contracting Officer, and no change shall be made without prior acceptance by the Contracting Officer.

The Project Manager shall have a recognized four-year college degree in engineering, architecture, or related technical field, and at least five (5) years experience in managing and supervising Department of Defense construction projects of similar size and scope.

1.3.5 Project Superintendent

A Project Superintendent shall be assigned. This individual shall have a minimum of five years experience as a superintendent on Department of Defense construction projects similar in size and scope to this contract. The project superintendent shall have overall responsibility for all operations on the jobsite. The superintendent shall be assigned no other duties.

1.3.6 Contractor Quality Control

To assure compliance with contract requirements, the Contractor shall establish and maintain quality control for materials and work, including design, covered by all sections of the TECHNICAL REQUIREMENTS in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Records shall be maintained for all operations including sampling and testing.

1.3.7 Safety

1.3.7.1 General

Site activities performed in conjunction with this contract may pose safety hazards that require specialized expertise to effectively address and eliminate. The Contractor shall be responsible for preparing and

implementing an effective safety and health program throughout the entire duration of the contract.

1.3.7.2 Accident Prevention Plan (APP)

The contractor shall prepare an Accident Prevention Plan in accordance with the provisions of FAR 52.236-13 (Section 00700) and Section 00800, paragraph S-36.18. The Accident Prevention Plan shall address the contractor's overall safety program for the entire contract. The APP shall consist of the forms and documents listed in Section 00800, S36.18, ACCIDENT PREVENTION PLAN, covering the overall safety considerations for the contract as a whole.

1.3.7.3 Site-Specific Safety and Health Plan (SSHP)

The contractor shall prepare a site-specific safety and health plan addressing the safety aspects specific to the work ordered. Work on a feature of work shall not commence prior to receiving the Contracting Officer's written acceptance of both the contract Accident Prevention Plan and the site-specific safety and health plan.

The SSHP shall be prepared in accordance with the requirements specified in this section and shall comply with all federal, state, and local health and safety requirements, e.g., the Occupational Safety and Health Administration (OSHA) requirements (29 CFR 1910 and 1926) and the U.S. Army Corps of Engineers Safety and Health Requirements Manual (EM 385-1-1). The SSHP shall address those elements that are specific to the feature of work that have potential for negative effects on the safety and health of workers, the public, and other personnel on site.

An Activity Hazard Analysis (AHA), POD Form 184-R, rev 16 Oct 98, shall be submitted for all phases of construction specific to the feature of work and worksite. Work on a construction phase cannot begin until the AHA is submitted and accepted.

The SSHP shall identify the individual responsible for jobsite safety. This individual shall be present at the jobsite at all times during construction. Copies of the accepted SSHP and Accident Prevention Plan shall be available at the jobsite at all times. All workers shall know the location of these plans. All workers shall receive a safety briefing covering applicable sections of these plans prior to the start of construction.

Daily safety and health inspections shall be conducted to determine if site operations are conducted in accordance with the accepted SSHP and contract requirements. Results and observations made during these inspections shall be noted in the contractor's daily report.

1.3.7.4 Safety and Health Manager

The Safety and Health Manager shall have direct responsibility for the overall management of the contractor's Safety Program for the entire contract, as required by the US Army Corps of Engineers Safety and Health Requirements Manual, EM385-1-1, and other applicable safety standards. This individual shall have a minimum of five (5) years experience in safety on Department of Defense construction projects similar in size and scope to this contract. All members of the safety staff are subject to review and acceptance by the Contracting Officer. The Safety and Health Manager shall

have no other duties.

## 1.4 AS-BUILT DRAWINGS

As-built drawings shall be in accordance with Section 01780 CLOSEOUT SUBMITTALS.

## 1.5 DUST CONTROL

Dust control measures shall be enforced throughout areas of demolition activity. A 15 foot high minimum dust/environmental screen barrier shall be provided where construction activity occurs adjacent to other activities and facilities. Dust barriers shall be equipped with posts and bracing to maintain the barrier in a plumb position. Barrier fabric shall be of sufficient strength to resist wear and tear for the duration of the construction activity. Dust barriers shall be approved by the Contracting Officer.

accordance with Section 02220 DEMOLITION.

## 1.6 PROTECTION

The Contractor shall take all necessary precautions to insure that no damages to private or public property will result from his operations. Any such damages shall be repaired or property replaced by the Contractor in accordance with the CONTRACT CLAUSES entitled "PERMITS AND RESPONSIBILITIES" and "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS", without delay, and at no cost to the Government.

### 1.6.1 Warning Signs and Barricades

The Contractor shall be responsible for posting warning signs or erecting temporary barricades to provide for safe conduct of work and protection of property.

### 1.6.2 Protection of Grassed and Landscaped Areas

The Contractor's vehicles shall be restricted to paved roadways and driveways. Vehicles shall not be driven or parked on grassed and/or landscaped areas except when absolutely necessary for the performance of the work and approved in advance by the Contracting Officer. Grassed or landscaped areas damaged by the Contractor shall be restored to their original condition without delay and at no cost to the Government.

### 1.6.3 Protection of Trees and Plants

Where necessary, tree branches and plants interfering with the work may be temporarily tied back by the Contractor to permit accomplishment of the work in a convenient manner, so long as they will not be permanently damaged thereby. If this is not feasible, the Contracting Officer may prune them, subject to written approval.

### 1.6.4 Protection of Building From the Weather

The interior of the building and all materials and equipment shall be protected from the weather at all times.

## 1.7 RESTORATION WORK

Existing conditions or areas damaged or disturbed by the Contractor's operations shall be restored to their original condition, or near original condition as possible, to the satisfaction of the Contracting Officer.

## 1.8 REMOVAL AND DISPOSAL

The Contractor shall salvage or recycle waste to the maximum extent practical as it relates to the capabilities of local industries. A record of the quantity of salvaged or recycled materials shall be maintained by the Contractor during the length of the project and submitted to the Contracting Officer at acceptance of the project. Quantities shall be recorded in the unit of measure of the industry. Reuse of materials on the site shall be considered a form of recycling. An example of such reuse would be the use of acceptable excavated materials as fill.

### 1.8.1 Title to Materials

Title to all materials and equipment to be removed, except as indicated or specified otherwise, is vested in the Contractor upon receipt of notice to proceed. The Government will not be responsible for the condition, loss or damage to such property after the Contractor's receipt of notice to proceed. Items indicated to be removed shall be removed and disposed of by the Contractor outside the limits of Government-controlled property at the Contractor's responsibility and expense before the completion and final acceptance of the work and such materials shall not be sold on the site.

### 1.8.2 Rubbish and Debris

Rubbish and debris shall be removed from Government-controlled property daily unless otherwise directed, so as not to allow accumulation inside or outside the building. Materials that cannot be removed daily shall be stored in areas designated by the Contracting Officer.

## 1.9 INTERFERENCE WITH GOVERNMENT OPERATIONS

The Contractor shall establish work procedures and methods to prevent interference with existing operations within or adjacent to the construction area. Free passage into adjoining or adjacent buildings not in the contract will not be permitted except as approved by the Contracting Officer. Procedures and methods shall also provide for safe conduct of work and protection of property that is to remain undisturbed.

### 1.9.1 Coordination

The Contractor shall coordinate all work with the Contracting Officer to minimize interruption and inconvenience to the occupants or to the Government. Scheduling and programming of work will be established during the pre-construction conference.

### 1.9.2 Materials and Equipment

All materials and equipment required to complete the project shall be on hand before work is started.

### 1.9.3 Utilities and Facilities

All utilities and facilities within the area shall remain operable and shall not be affected by the Contractor's work, unless otherwise approved in writing in advance by the Contracting Officer.

### 1.9.4 Staking and Flagging Existing Utilities

The Contractor, prior to start of any excavation or trenching work, shall verify the location of all utility lines shown on the drawings which are within the areas of work, and shall mark, stake, or flag each utility line along trench alignments and under areas of excavation under this project, as approved. Existing utility lines shall be located by walking trench alignments with approved equipment for locating underground pipes and cables. Utility lines so located shall be noted on the drawings.

## 1.10 CONTRACTOR'S OPERATIONS OR STORAGE AREA

The Contractor’s operation and storage area is limited to areas within the limits of work.

## 1.11 CONTRACTOR PARKING

Parking for the Contractor’s, his employee’s, and subcontractors’ personal vehicles is limited to areas within the limits of work. Personal vehicle parking is prohibited anywhere else within the boundaries of Schofield Barracks Military Base.

## 1.12 GOVERNMENT PROJECT OFFICE

The Contractor shall provide, for use by Government supervisory and inspection personnel, a job-site office space with a floor area not less than 500 square feet, with minimum twice-per-week janitorial service. This office space may be within the Contractor's project office building if adjacent to the job site and if separated by a solid partition; otherwise a separate facility, adjacent to the job site, shall be provided. The office shall be provided with windows and screens, air conditioning to maintain not more than 22 degrees C, electricity, wall outlets, ceiling lights, (1) telephone and (3) cellular phones or (4) cellular phones, (3) office desks with drawers, (3) layout tables, (5) ergonomic chairs, (4) legal-size five-drawer locking file cabinets, (3) 3-shelf bookcase, (3) plan racks, (1) fire extinguisher, and (3) computers.

Provide potable drinking water and temporary toilet facilities for Government personnel. Contractor's copier and fax machine shall be available for use by Government personnel. Contractor shall provide (4) vehicle parking spaces for Government personnel at the project office. The cost of utilities including two telephone lines with different telephone numbers (one number for the telephone instrument and one for the modem), air conditioning, and operation and maintenance costs of the Government project office shall be borne by the Contractor. The government will be responsible for its long distance calls. Upon completion of the project, the project office and furnishings shall be removed and disposed of by the Contractor.

### 1.12.1 Computer Requirements

The Contractor shall provide computers for use by Government personnel assigned to this contract. These computers shall be Dell Optiplex GX260 or approved equal (proposed "equal" systems require approval by the Government prior to contract award), minimally configured as follows:

| **Feature** | **Requirement** |
|---|---|
| OptiPlex GX260 Small Minitower | Pentium ® 4 Processor, 2.40GHz, 533FSB, 512K |
| Memory: | Cache, Intel Gigabit NIC, 1.0GB DDR Non-ECC SDRAM (2DIMMs) |
| Keyboards: | Dell PS/2 Keyboard in Gray, No Hot Keys |
| Monitors: | Dell 17 inch M782 flat CRT color monitor (16.0 viewable) |
| Video Boards: | 32MB, ATI, Radeon ™ 7500 |
| Boot Hard Drives: | 40GB EIDE 7200RPM |
| Card Reader: | 5.25 inch PCMCIA Reader with Required PCI Controller Card |
| Floppy Drives: | Internal 1.44MB 3.5 Inch Floppy Drive |
| Operating System(s): | Windows ® 2000 Professional, SP3 with CD using NTFS |
| Mouse. | Microsoft PS/2 2-Button IntelliMouse with Scroll |
| Network Adapters (NICs): | Integrated Intel Gigabit (10/100/1000) with Alert Standards Format |
| Modems: | Dell V.92 PCI Data/Fax Controllerless Modem for Windows |
| 1st Removable Media and DVD+RW Options: | 48X CD-RW/DVD Combo, with Roxio Easy CD Creator TM and DVD Decode |
| Audio Solutions | Integrated Sound Blaster Compatible |
| Speakers: | Harman Kardon 206 Speakers |
| Documentation: | Resources CD contains Diagnostics and Driver for Dell OptiPlex Systems |
| Additional Hard Drive or ZIP Drive: | Zip 250 Disk Drive |
| Energy Star Label: | Energy Star Label |
| Hardware Support Services: | 3Yr Same Day 4Hr Response Parts + Onsite Labor (M-F 8am-6pm) |
| Optional Support Services | Gold Technical Support, OptiPlex, 3 Years |
| Installation Support: | No Installation |
| Mouse Pad: | Mouse Pad |
| Power Protection: | Surgemaster Gold 9 outlet |
| Additional Software: | Microsoft Office 2000<br>Adobe Acrobat 5.0 |

The Contractor shall have delivered all required computer hardware and software directly to the Government Project Office in factory-sealed, unopened boxes. Any boxes delivered with damaged or tampered seals will be rejected by the Government and shall be replaced by the Contractor at no additional cost to the Government. The Government will perform set up of the computers in the Government Project Office.

The Contractor shall provide all software licenses and software updates for the duration of the contract. Hardware shall be provided with a 3-year manufacturer's onsite maintenance contract. Should the construction contract last longer than 3 years, at the end of the maintenance contract, the Contractor shall provide new computers, similar to the above, except

configured to the standard at that time. The Government will provide specifications for replacement workstations and hardware.

At the end of the construction contract, the Government will turn over all contractor-provided hardware and software to the Contractor. Hard drives will be wiped clean of all software, including the operating system.

1.12.1.1 Other Devices (minimum requirements)

Printer: Hewlett-Packard Laserjet 5100TN or 5100DTN or approved equal (must be HP PCL compatible), Digital Camera: Kodak LS443 with additional 256 MB memory card, or approved equal.

1.12.1.2 Connectivity Requirements

The Government Project Office shall be provided with one high speed internet connection (RoadRunner ™ or DSL) with a minimum download speed of 2 Mbps and a minimum upload speed of 384 kbps.

1.12.1.3 Networking Requirements

The Government Project Office shall be configured with a local area network that includes a hub with a minimum of five (5) ports. Wiring shall be CAT5 twisted pair cabling terminated with RJ-45 connectors, which will run from the cable-modem/hub to each of the workstations and/or other devices.

1.13 WORKING DIRECTIVES

1.13.1 Working Hours

All work shall be performed between the hours of 0730 to 1600 HST, Monday through Friday. No work shall be accomplished on Saturdays, Sundays, and all federal holidays, without written permission from the Contracting Officer. Such written permission shall be available at the jobsite at all times during construction.

1.13.2 Phasing

Buildings 356, 357, and 358 will be turned over to the Contractor no earlier than February 1, 2004, but no later than March 1, 2004. Building 355 will be turned over to the Contractor no earlier than February 1, 2005, but no later than March 1, 2005. The Contractor will only have limited access to all buildings prior to their turnover. Work in the buildings cannot start until the building is turned over to the Contractor. All utilities in the buildings shall remain fully operational until the building is turned over to the Contractor.

1.14 COMMERCIAL TELEPHONE SERVICE LINES

Availability of existing commercial telephone service lines are extremely limited and/or non-existent. Contractor shall coordinate with Verizon Hawaii to verify the extent of commercial telephone service lines available and what actions may be necessary to obtain said service in the magnitude required to satisfy its operational requirements. Notwithstanding the actual level of commercial telephone service lines available, the Contractor shall be responsible for all costs and necessary actions.

## 1.15 INSPECTION

### 1.15.1 Final Inspection and Acceptance

The Contractor shall give the Contracting Officer, a minimum of fourteen (14) calendar days advance notice prior to final inspection for acceptance by the Contracting Officer. The Contractor upon notification by the Contracting Officer shall promptly and satisfactorily correct all deficiencies found on final inspection.

## 1.16 USE OF PRODUCTS CONTAINING RECOVERED MATERIALS

Recovered materials are materials manufactured from waste material and byproducts that have been recycled or diverted from solid waste. The Contractor shall give preference to products containing recovered material when price, performance, and availability meet project requirements. A listing of products, including the recommended recovered material content, is provided by the Environmental Protection Agency at http://www.epa.gov/cpg/products.htm. Only those products having recovered material content equal to or greater than EPA guidelines shall be used to meet this requirement.

# PART 2 PRODUCTS. (NOT APPLICABLE)

# PART 3 EXECUTION (NOT APPLICABLE)