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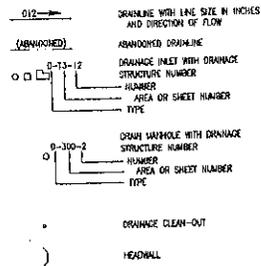
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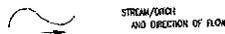
SCHOFIELD BARRACKS MASTER PLAN MAPS, DRAFT REPORT, FY96 OMA FAMILY
HOUSING MASTER PLAN AND INFRASTRUCTURE STUDY, ARMY STORM
DRAINAGE INFRASTRUCTURE STUDY FOR SCHOFIELD BARRACKS
AND
SUPPLEMENTAL LEWIS ST. DRAINAGE SCOPE OF WORK INFORMATION

STORM DRAINAGE MAP LEGEND

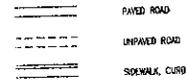
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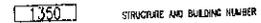
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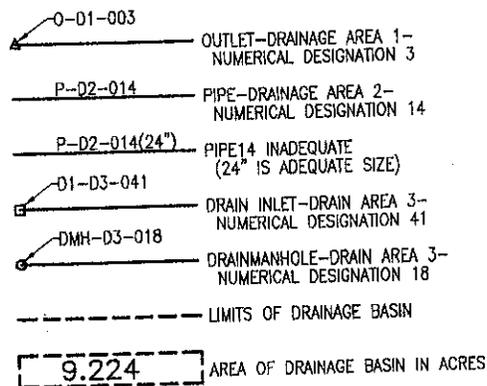
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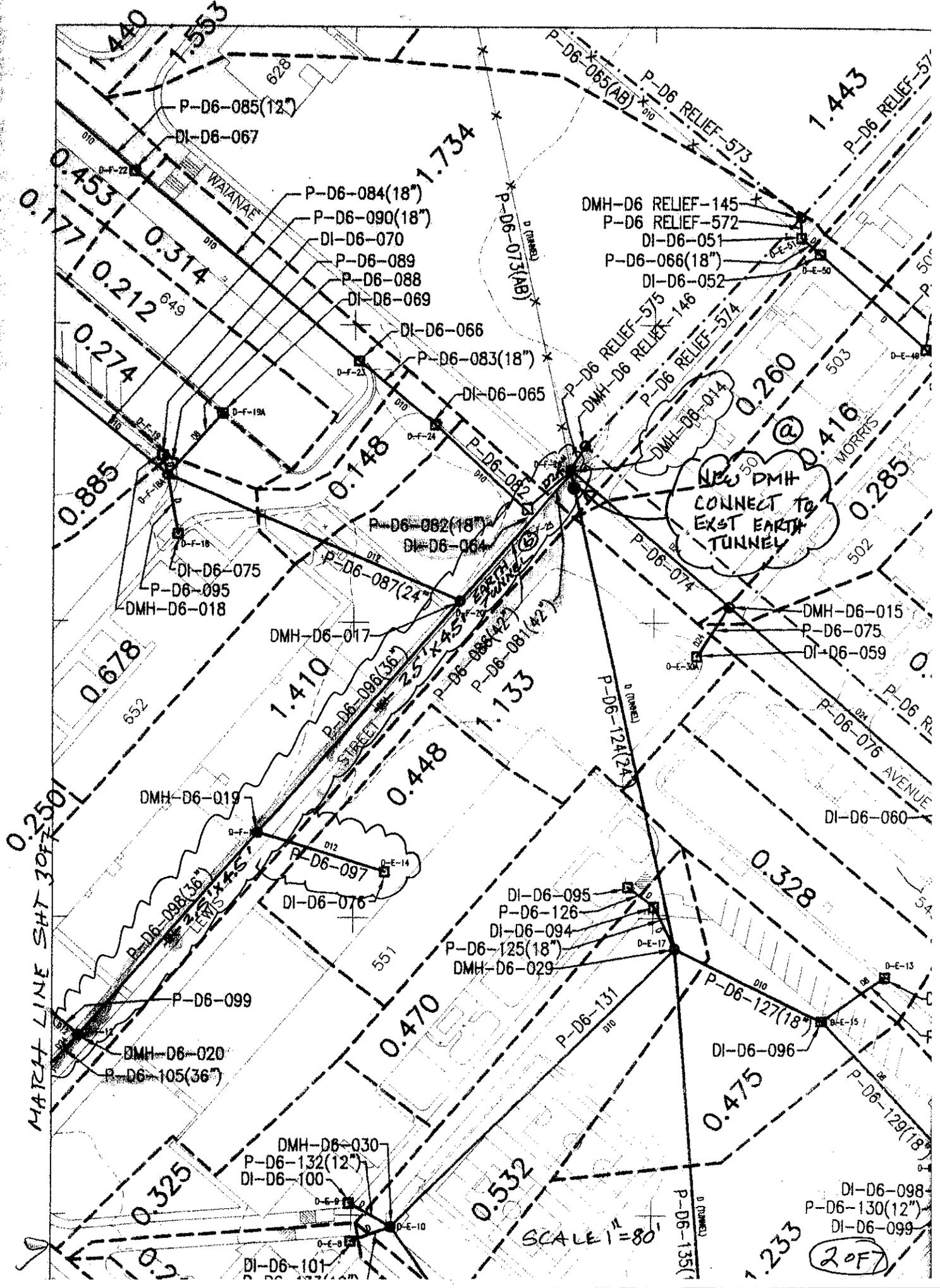


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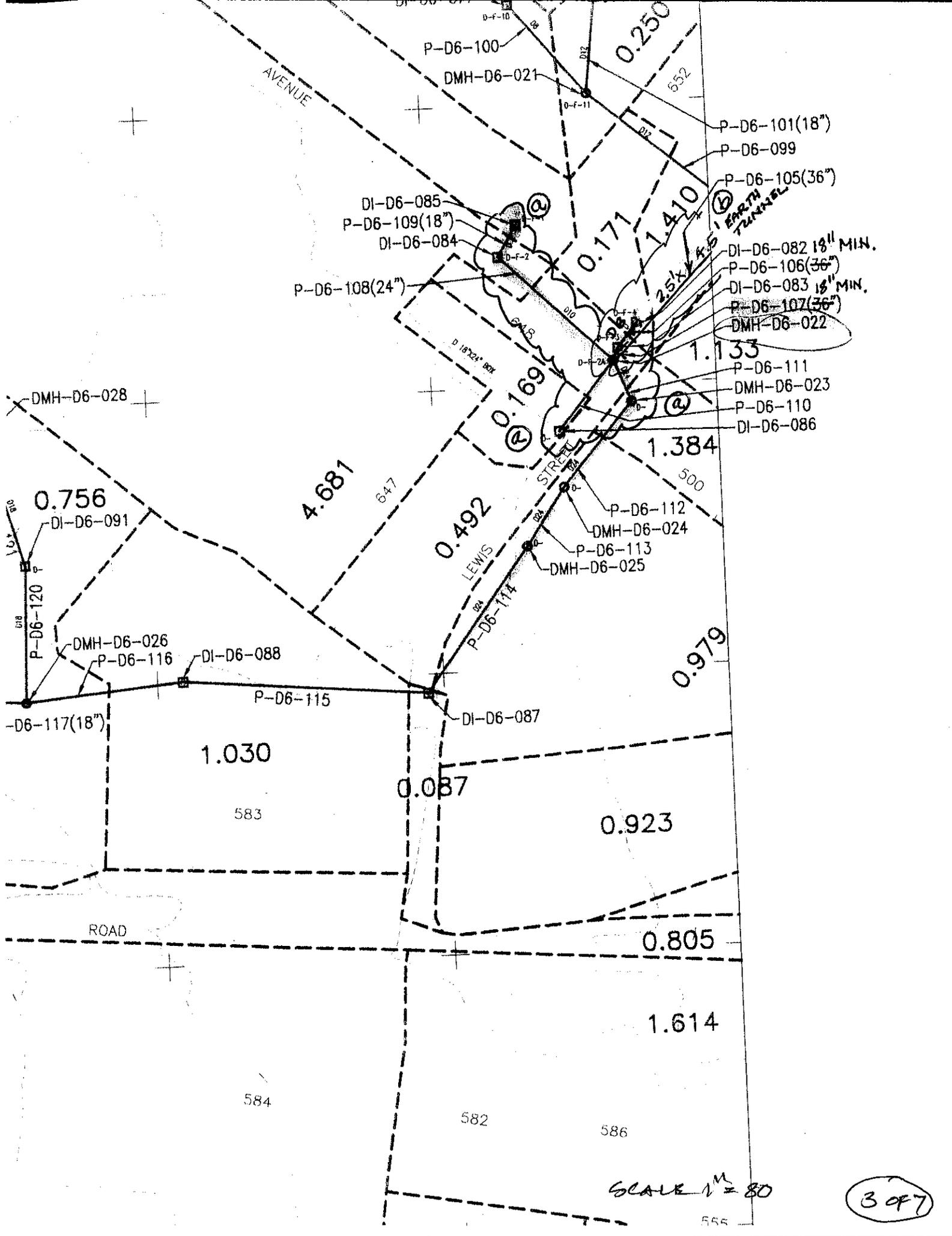
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DI-D6-083 18" MIN.

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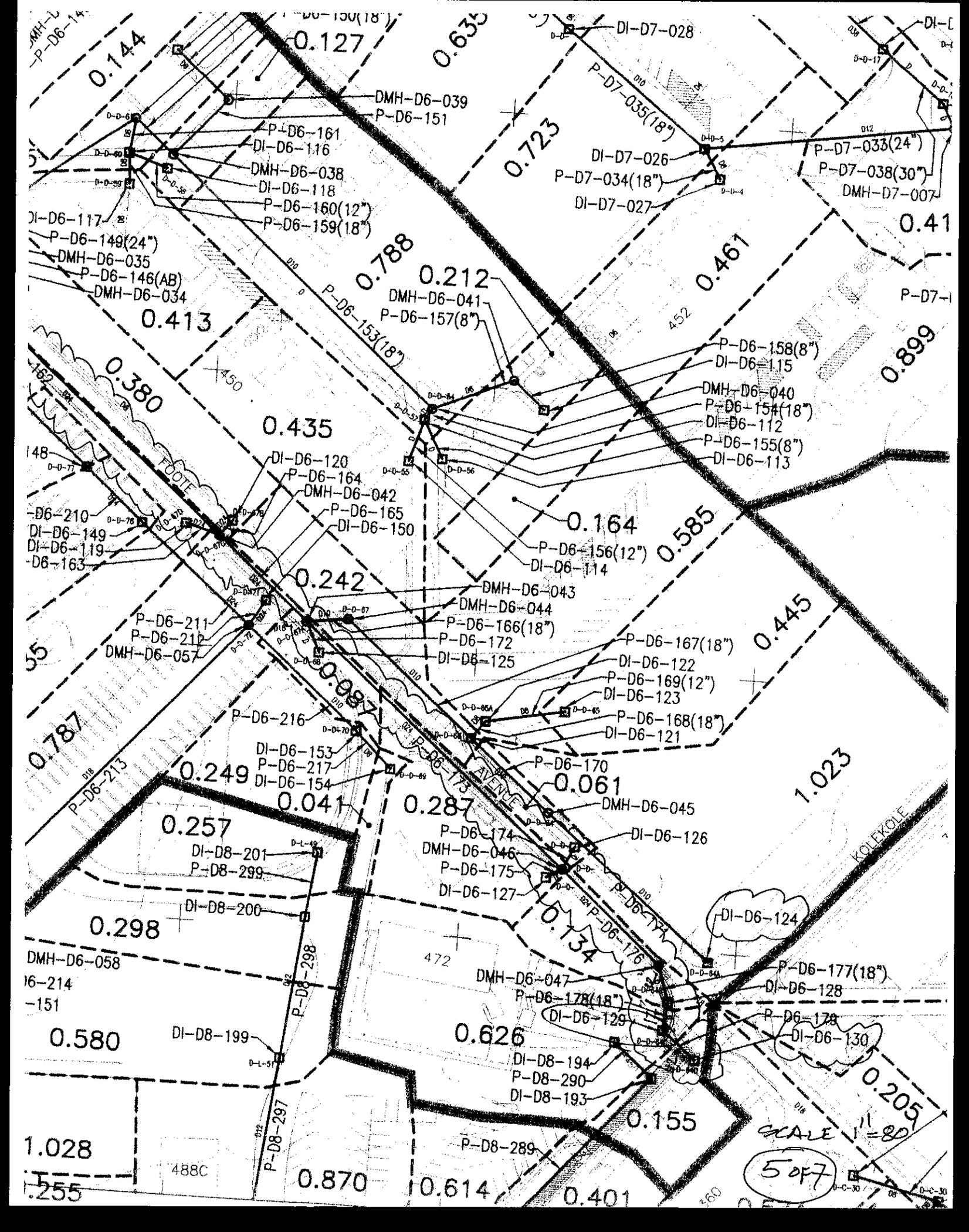
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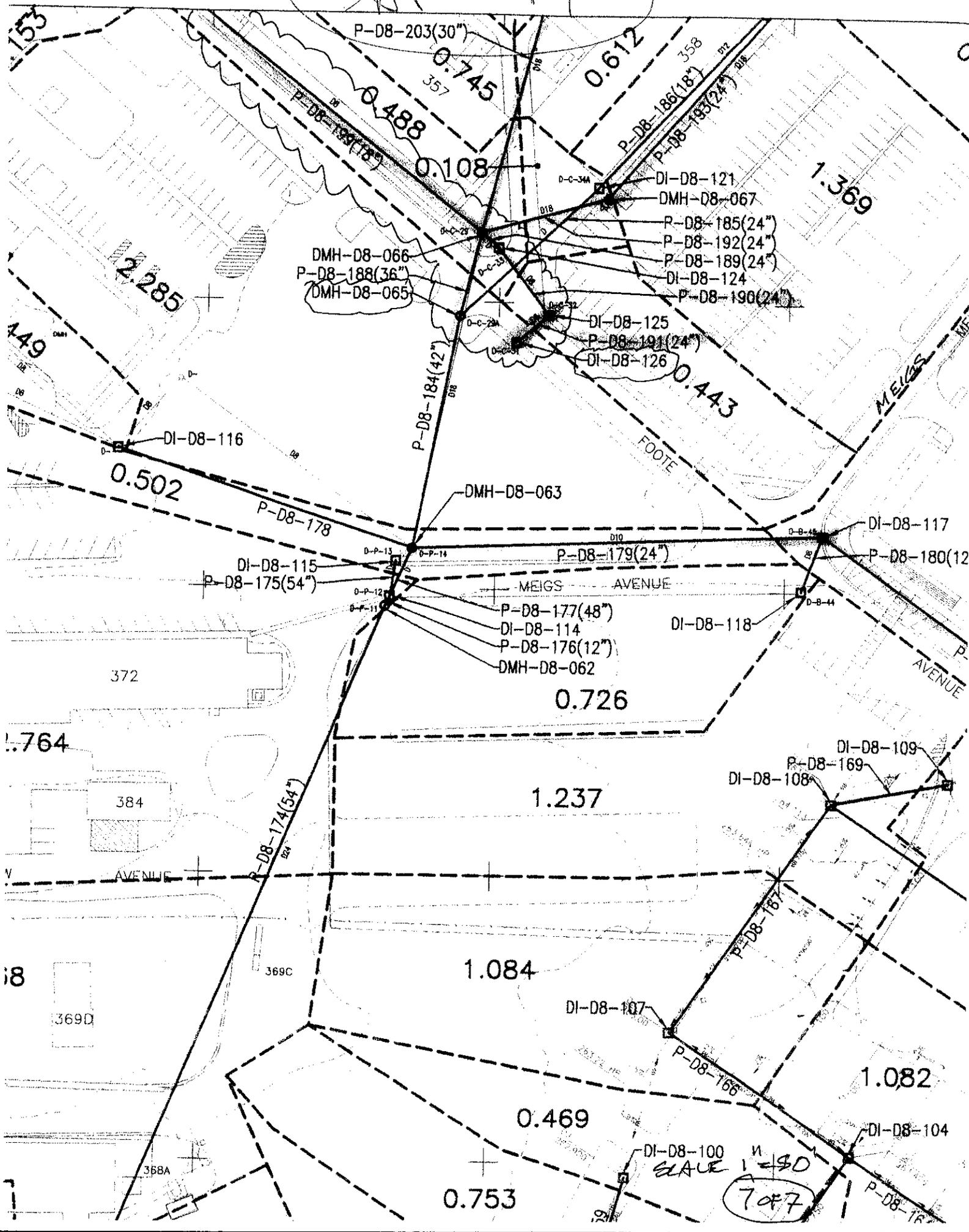
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P-D8-178

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MEIGS AVENUE

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P-D8-166

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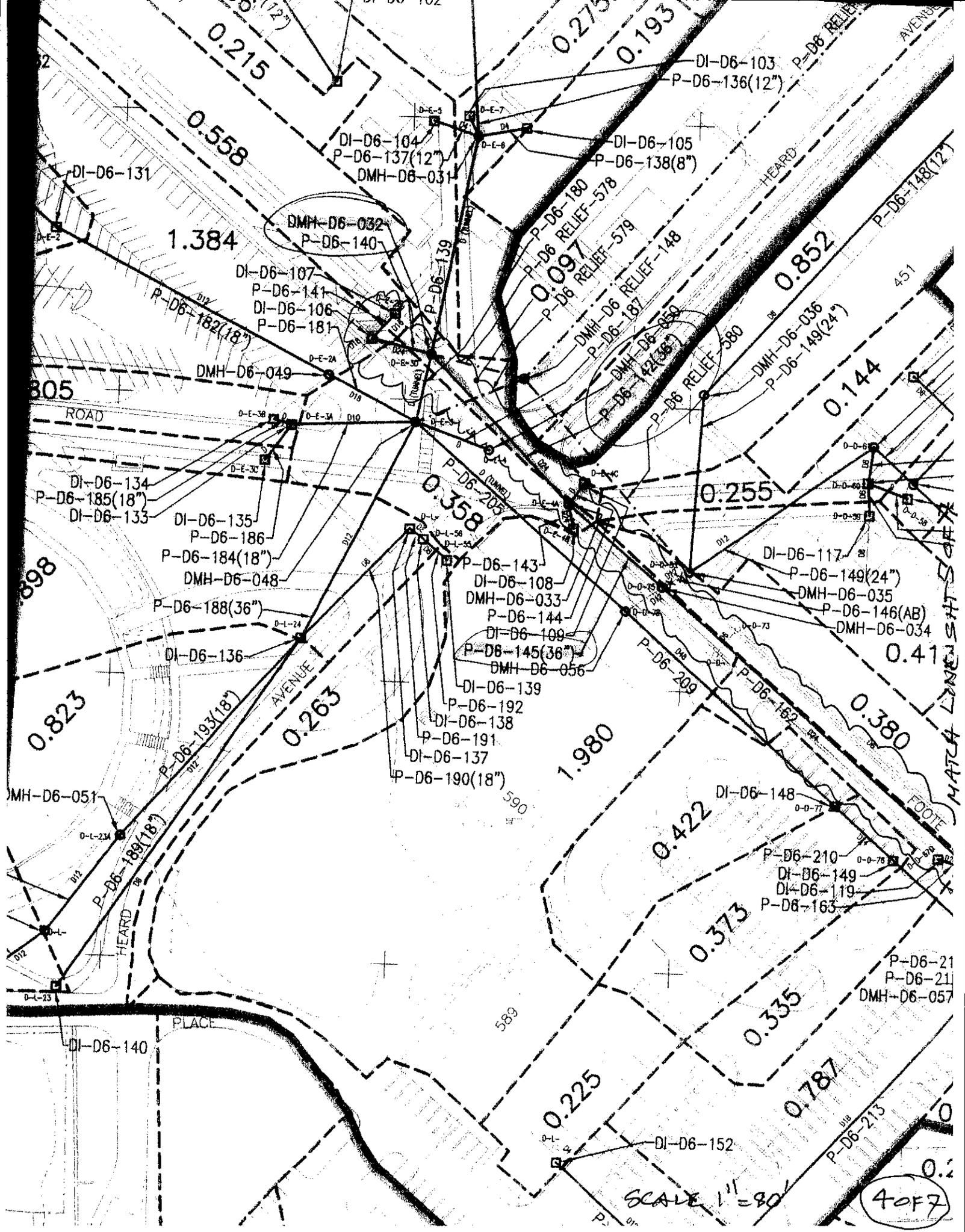
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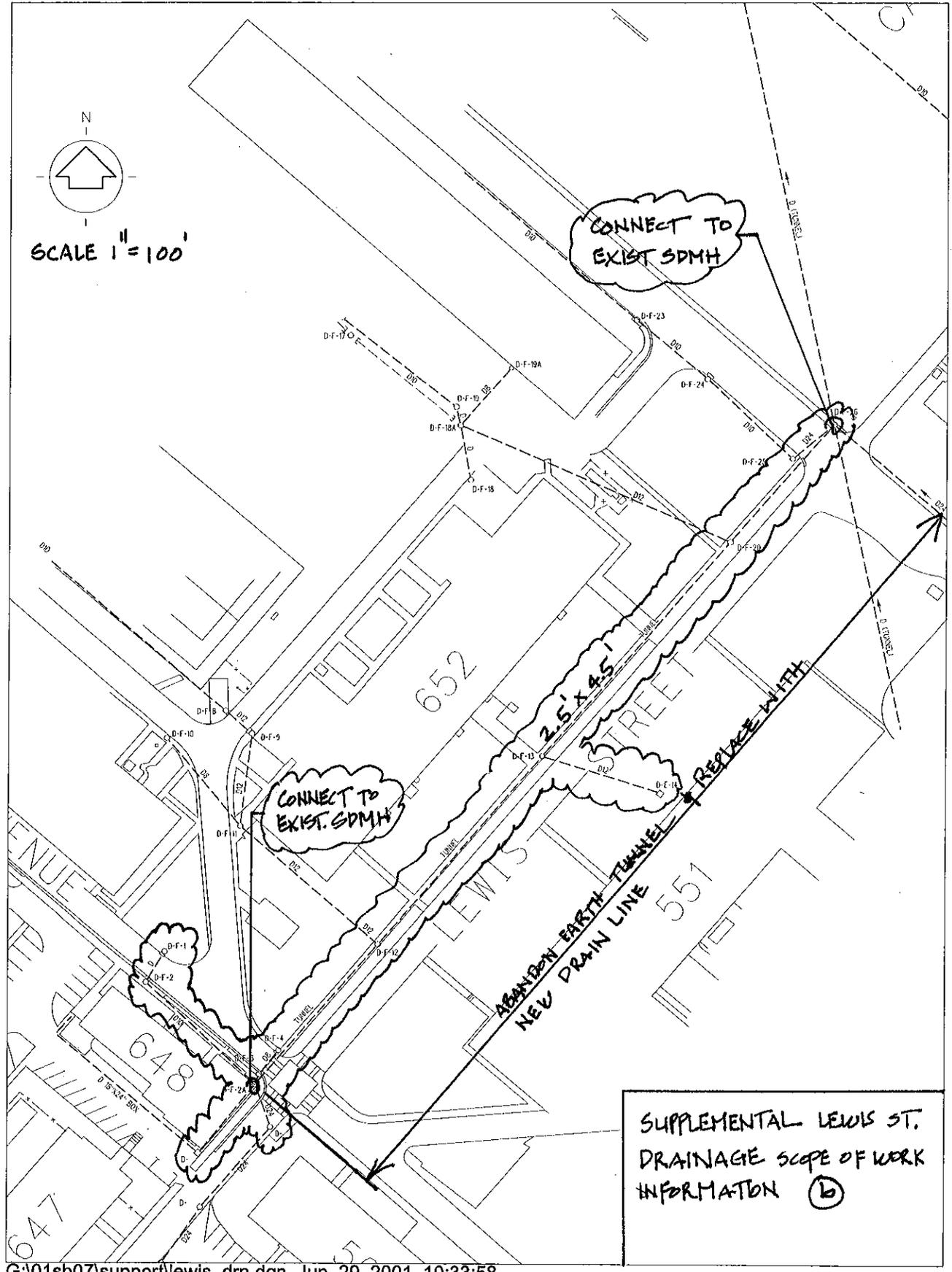
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SUPPLEMENTAL LEWIS ST.
DRAINAGE SCOPE OF WORK
INFORMATION (b)

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1 of 1

ATTACHMENT 20

SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT FOR THE RENOVATION OF
QUADS B, C, D, E AND F AT
SCHOFIELD BARRACKS MILITARY RESERVATION, OAHU, HAWAII
FOR THE WHOLE BARRACKS RENEWAL PROGRAM

Draft

**Supplemental Environmental Assessment for the
Renovation of Quads B, C, D, E and F at Schofield Barracks
Military Reservation, Oahu, Hawaii for the Whole Barracks
Renewal Program**

Proposing Agency:

U.S. Army Garrison, Hawaii
Directorate of Public Works
Schofield Barracks Military Reservation, Hawaii 96857-5000

February 2001

Draft

**Supplemental Environmental Assessment for the
Renovation of Quads B, C, D, E and F at Schofield Barracks Military
Reservation, Oahu, Hawaii for the Whole Barracks Renewal Program**

Prepared for the Proponent by:

Submitted by the Proponent:

Ronald N. Light
Lieutenant Colonel, EN
Commander
U.S. Army Corps of Engineers,
Honolulu District

Date

William E. Ryan III
Colonel, U.S. Army
Director of Public Works
U.S. Army Garrison, Hawaii

Date

Approved By:

William R. Puttmann, Jr.
Colonel, U.S. Army
Commander
U.S. Army Garrison, Hawaii

Date

February 2001

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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 1.0 OVERVIEW

1.1 Introduction

The preparation of this Supplemental Environmental Assessment (EA) complies with the substantive provisions of the Council of Environmental Quality (CEQ) National Environmental Protection Act (NEPA) regulations, 40 CFR Part 1500 and Army Regulation 200-2.

This Supplemental EA is tiered to the *Final Programmatic EA and Finding of No Significant Impact for the U.S. Army Whole Barracks Renewal Program, Oahu, Hawaii* (hereafter referred to as the *Final Programmatic EA*) that was completed in July 1995 for the Department of the Army. The *Final Programmatic EA* is hereby incorporated by reference.

As indicated in AR 200-2, tiering refers to the coverage of general matters in broader environmental documents (e.g., the *Final Programmatic EA*) with subsequent narrower statements or environmental analyses (e.g., this Supplemental EA). Tiering is appropriate when it helps the decision maker to focus on issues that are ripe for decision and exclude from consideration issues already decided or not yet ripe.

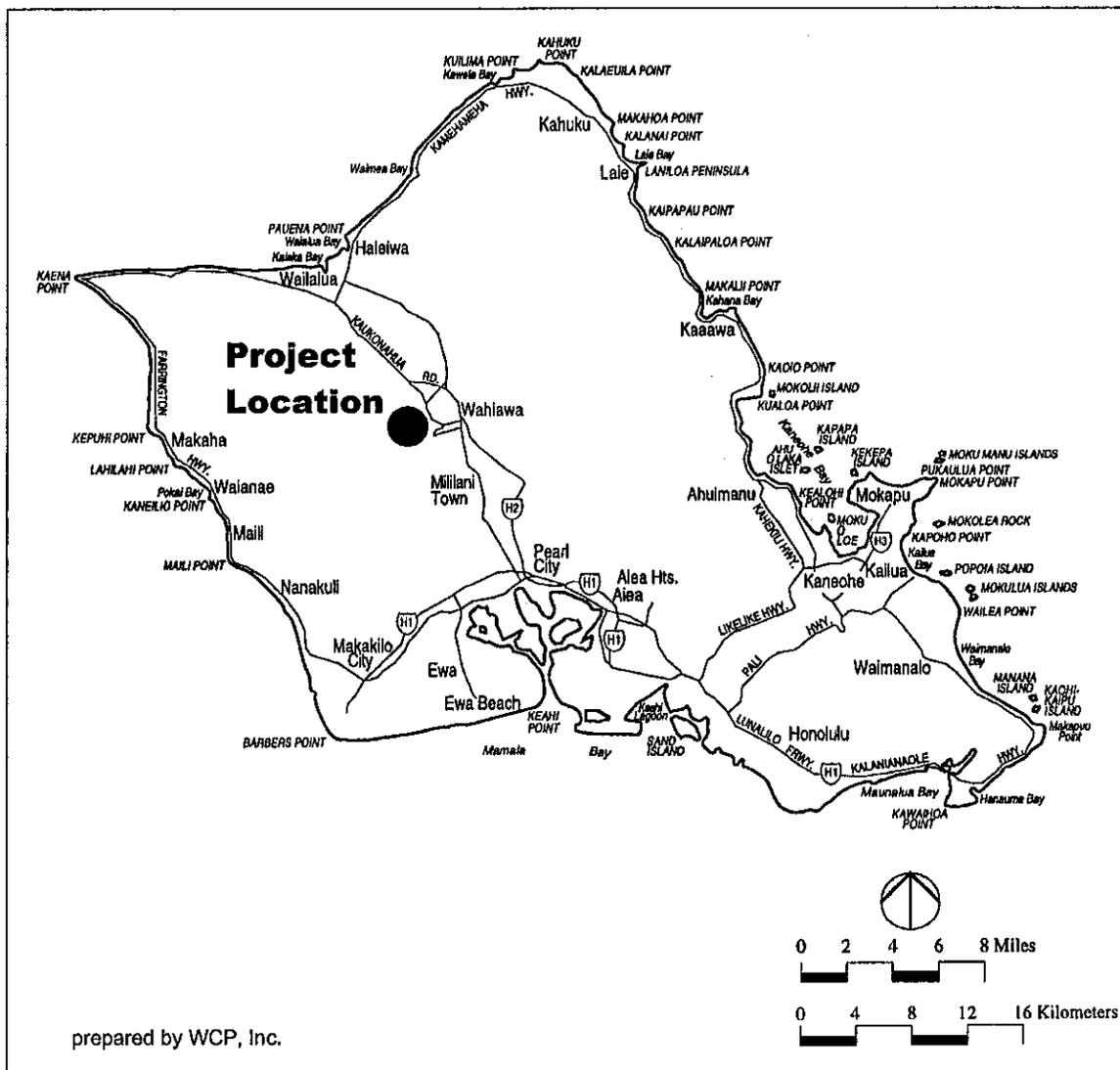
The purpose of the *Final Programmatic EA* was to evaluate the Whole Barracks Renewal (WBR) Program: a long-term Army-wide effort to modernize unaccompanied personnel living facilities at the 25th Infantry Division (ID) Light (L) and U.S. Army, Hawaii (USARHAW) installations. Actions considered in the programmatic analysis included the construction of new barracks plus support facilities and the renovation of existing substandard barracks located on the island of Oahu, Hawaii at Schofield Barracks Military Reservation, Helemano Military Reservation (HMR), Wheeler Army Airfield (WAAF), Fort Shafter and Tripler Army Medical Center (TAMC). The timeframe for the WBR Program is a period of over 50 years (depending on funding availability) beginning with Fiscal Year 1995 (FY95).

Statements in the *Final Programmatic EA* indicated that a Supplemental EA would be prepared to adequately assess any site-specific potential impacts under conditions existing near the time of implementation prior to each phase of WBR Program actions after FY98. The intent of this supplemental environmental impact analysis is to address the environmental consequences of the proposed Army project to renovate and operate Quads B, C, D, E and F at Schofield Barracks Military Reservation.

1.2 Project Location

Schofield Barracks Military Reservation is located on the island of Oahu, the third largest and most populous island in the Hawaiian Archipelago. The installation is bounded by the remnants of two shield volcanoes, the Koolau Mountain Range to the east and the Waianae Mountain Range to the west. Between the mountain ranges lies the Leilehua or Schofield Plateau. Schofield Barracks Military Reservation is located on this north central plateau in the Wahiawa District of Oahu (see Figure 1). Access to the installation is via Kamehameha Highway, the H-2 Freeway, Kaukonahua Road, Kunia Road, and Wilikina Drive.

Figure 1: General Location



Project actions will affect the buildings in Quads B, C, D, E and F on the Main Post of Schofield Barracks Military Reservation (see Figures 2 and 3).

Figure 2: Project Vicinity

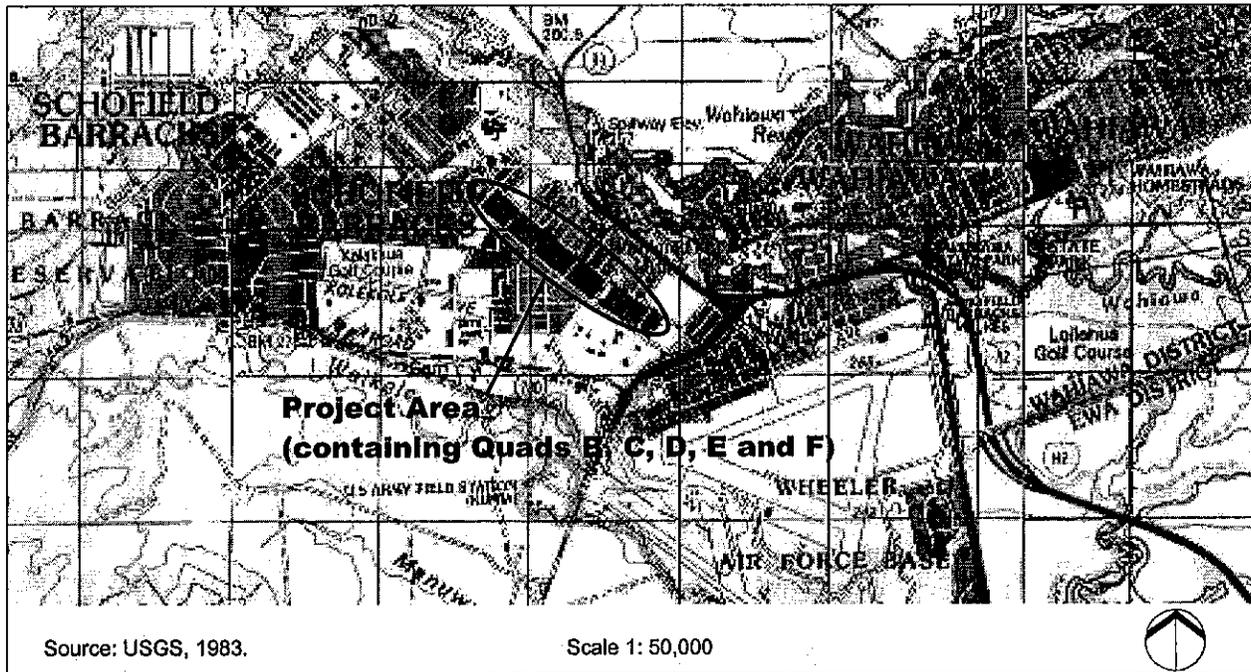
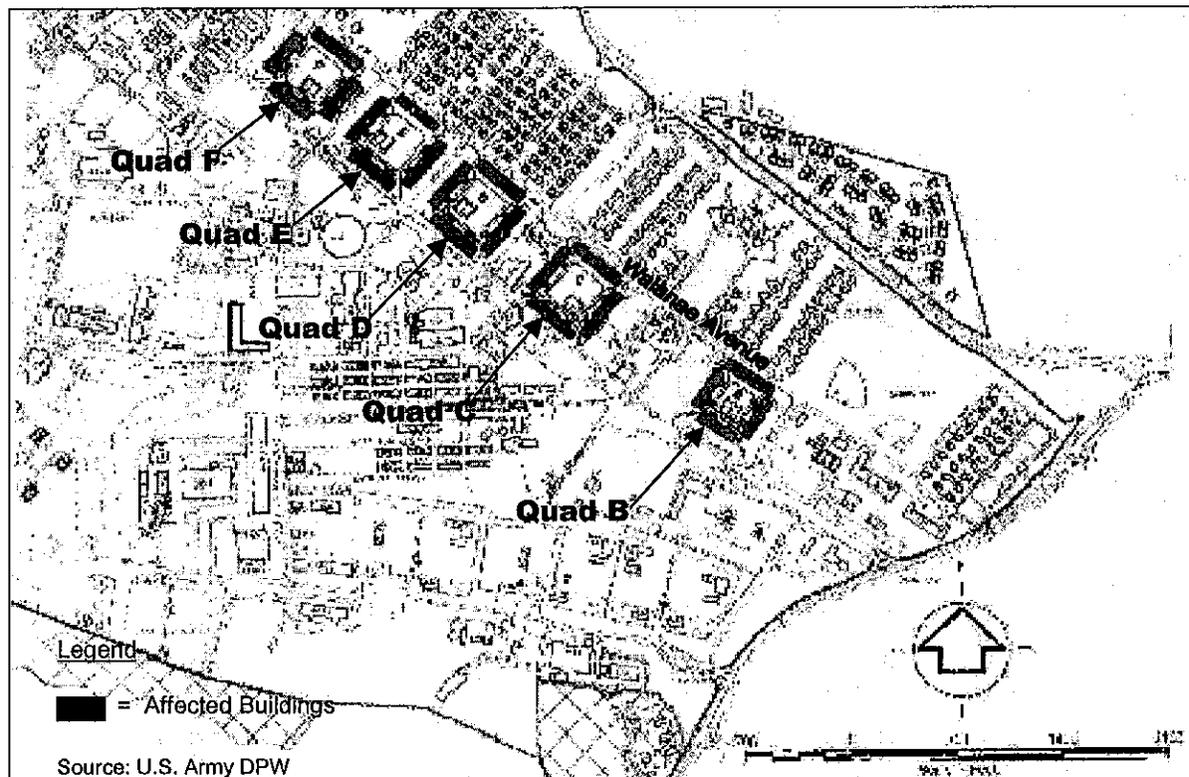
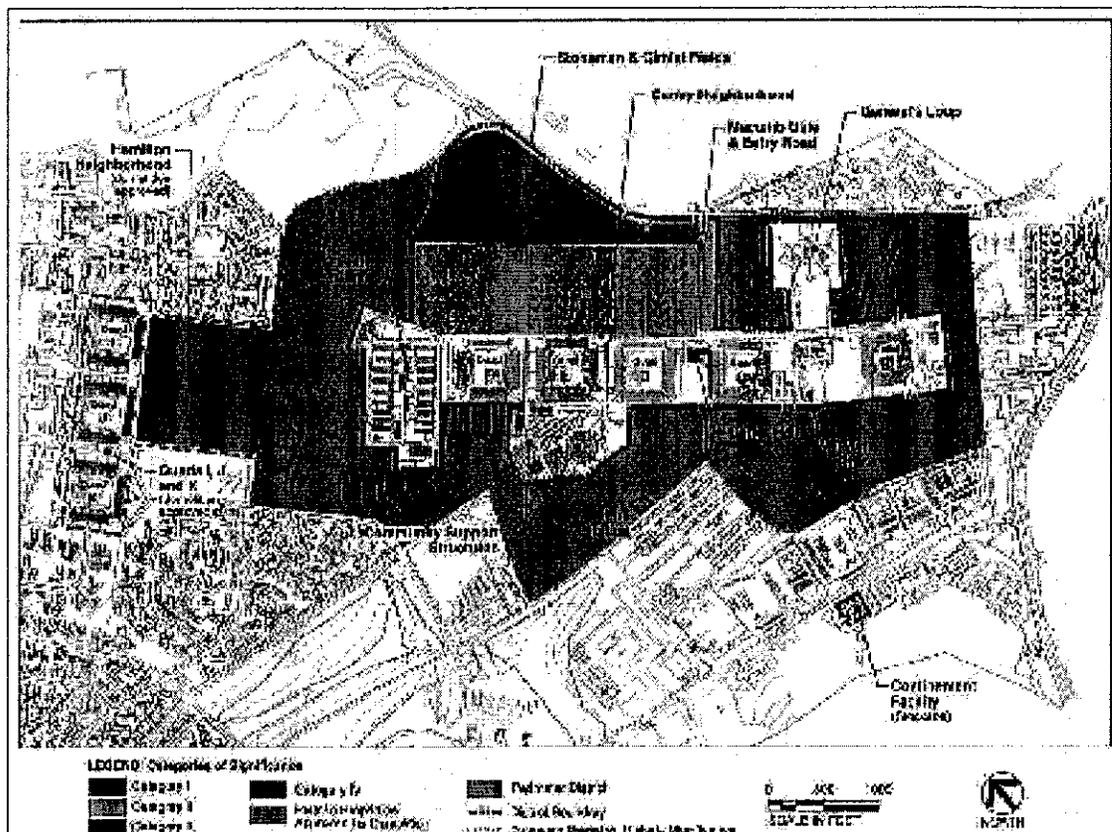


Figure 3: Project Sites on Schofield Barracks Military Reservation



As depicted in Figure 4, the Quads that would be affected by project actions are located within the Schofield Barracks Historic District which is listed on the State and National Register of Historic Places.

Figure 4: Schofield Barracks Historic District



Source: Belt Collins Hawaii, et al., 2000

1.3 Background

Information in this section is excerpted from *A History of Schofield Barracks Military Reservation* (Alvarez, 1982) and from previous investigations performed by the Army and its contractors.

In 1899, shortly after the annexation of Hawaii, land for Schofield Barracks Military Reservation was acquired by a Presidential Executive Order that set aside 14,604.95 acres for a military reservation. A temporary Army installation was established on a portion of these lands in 1908. The installation "was envisaged as the major defender of the corridor which led to the Pearl Harbor Naval Station on Oahu's southern coast" (Alvarez, 1982, pg.2). In 1909, it was first occupied by elements of the 5th Cavalry Regiment. Under Capt. Castner's supervision, 250 buildings were erected by 1911. Between 1911 and 1917, the initial planning and construction of a permanent post occurred. By 1914, the population of the installation was approximately 6,000 troops. Although the onset of World War I initially had little impact on the installation,

construction was temporarily halted. In 1917, Schofield Barracks Military Reservation became a training camp for officers and all of its tenants were eventually called to war. Construction resumed with the return of the troops by 1920. In 1936, the discovery of a reliable potable water source finally solved the water shortage that had plagued the installation from its inception. As a result, Schofield Barracks Military Reservation increased in military value and developed rapidly while receiving much of the newest military technology.

Following the attack on Pearl Harbor and during the Korean War, Schofield Barracks Military Reservation served as a combat troop staging area and basic training center. It housed the 24th and 25th Infantry Divisions (ID), both of which served abroad following the end of World War II. In 1954, the 25th ID was called back to headquarters at Schofield Barracks Military Reservation. Following the Korean War, United States Army Support Command, Hawaii (USASCH) headquarters were established at Fort Shafter due to various command restructuring. During the Vietnam conflict, Schofield Barracks Military Reservation again served as a combat troop staging center but not as a training center. Additional acreage was leased, bringing the total area of the post to 17,597.00 acres. The 25th ID, whose headquarters have been housed at Schofield Barracks Military Reservation since 1971, was configured into a light (L) division of approximately 10,000 soldiers in 1986.

1.4 Mission of Schofield Barracks Military Reservation

The military mission at Schofield Barracks Military Reservation is to support the 25th ID (L) and U.S. Army Hawaii (USARHAW) by providing training, administrative, housing, and community facilities. References to the 25th ID (L) and USARHAW will hereafter appear as U.S. Army. Depot and repair facilities, a medical facility, and community and housing support are also provided.

According to the *Final Programmatic EA* (pg. 4-48), there are 17,169 enlisted Army personnel on Oahu, of which 7,850 are authorized to occupy unaccompanied billeted space such as barracks buildings in Quads B, C, D, E and F. Approximately 6,700 of these soldiers are billeted at Schofield Barracks Military Reservation (*ibid*). The total population of approximately 19,500 persons at Schofield Barracks Military Reservation constitutes the highest concentration of military personnel and dependents in Hawaii (U.S. Army, 1993).

General operations performed at Schofield Barracks Military Reservation include administration, training, and small-scale industrial operations such as vehicle repair and maintenance, weapons refinishing, laundry, etc. Major industrial operations are not performed on-base. Both nonfiring (e.g., field tactical training, tactical problem solving, and routine bivouacking) and firing training activities occur at Schofield Barracks Military Reservation. Live ammunition is included in some firing activities.

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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 2.0 PURPOSE OF AND NEED FOR THE ACTION

2.1 Purpose of the Action

As stated in Section 1.2 of the *Final Programmatic EA* (pg. 1-3), the WBR Program was adopted by the Army to provide improved living standards for all eligible single enlisted personnel assigned to U.S. Army installations. Each Quad needs to comply with the standards promulgated by the Army's WBR Program which define the major planning goals and objectives. These goals and objectives are as follows:

1. Provide improved living standards at U.S. Army installations for all eligible bachelor enlisted personnel.
2. Accomplish these changes without displacing additional soldiers from on-post accommodations to housing within the local economy during barracks renovations.
3. Maintain unit integrity at the Brigade level whenever possible.
4. Provide operational headquarters spaces for the battalion and company headquarters displaced by barracks renovations and locate the headquarters in proximity to assigned billeting areas.
5. Modernize and expand existing dining facilities.
6. Provide adequate gym facilities.

2.2 Need for the Action

The *Final Programmatic EA* concluded that the overall WBR Program would not have any unmitigable, significant adverse effects on the environment (pg. 7-1). A detailed level of analysis was provided in the *Final Programmatic EA* for Phase One actions of the WBR Program (e.g., FY95, FY97 and FY98 projects). A similar level of detail was unavailable for subsequent actions not yet programmed as of July 1995; therefore the *Final Programmatic EA* calls for the preparation of site-specific environmental documentation for subsequent actions (*ibid*). As shown in Table 2-1 on page 2-25 of the *Final Programmatic EA*, the proposed renovation of Quads C and D, E and F, and B are WBR Program actions planned for Phases 3, 5, and 15, respectively. A funding allocation for the repair of 2,848 existing substandard units has resulted in the rescheduling of the renovation of the Quads, such that the preparation of this Supplemental EA is necessary at this time.

Renovation of Quads B, C, D, E and F is considered necessary because the affected buildings are in an obsolescent state whereby its occupants are subject to substandard living conditions. Repairs are necessary to allow the buildings to conform to current standards intended to provide soldiers with a higher degree of privacy, security, and comfort. Buildings in the Quads were constructed between 1915 and 1931 with the last

major renovation occurring in the latter part of the 1970s. The Quads were designed to provide centralized housing, dining, and administrative space for troops stationed at Schofield Barracks Military Reservation. As a result of the original design, soldiers housed in the Quads are allotted small living spaces (90 square feet per man) and bathroom facilities do not allow for privacy. The existing buildings lack proper plumbing, lighting, ventilation, and partitions for security, privacy, comfort and noise abatement. With the current configuration and organization, the living quarters for single soldiers are located in the same building as unit operations and headquarters facilities. For all of these reasons, the living spaces in the barracks are inconsistent with the living standards of today.

SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 3.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

3.1 The Proposed Action: Repair and Renovate Existing Assets

The Proposed Action to repair and renovate Quads B, C, D, E and F would provide the soldiers of the U.S. Army with adequate facilities for living and working. Buildings used as barracks will be completely renovated to improve living conditions for unaccompanied enlisted soldiers. Dining facilities will be repaired and renovated. Billeting functions will be separated from unit operations and headquarters facilities to provide a higher degree of privacy, security, and comfort for the soldier. Company operations facilities with arms vaults, equipment maintenance areas, unit storage and equipment storage areas will be repaired. Intrusion detection systems (IDS) will be installed in all arms vaults. The actions to be accomplished for Quad F are described below to provide an example of the nature of proposed repair and renovation work that will be adapted for the other Quads. The timing and types of actions to be accomplished for the other Quads are dependent on funding availability and associated considerations.

Quad F. Work would commence in FY01. Structural upgrades for all four buildings would be accomplished to meet current standards. Existing concrete block walls would be identified. Flooring, windows and air handling units in the buildings would be replaced. A covered soldier gear wash area within Quad F would be provided for the cleaning of personal gear. (The area would also be used as a covered recreational area for social gatherings).

- Building 649. The existing barracks building would be repaired to provide improved living spaces for 92 unaccompanied enlisted personnel. Repair work to be accomplished would renovate the living/sleeping rooms, baths, walk-in closets, service areas, janitor's closets, mechanical rooms, electrical rooms and telecommunication rooms.
- Building 650. The dining facility would be repaired. Brigade headquarters and community support functions (e.g., laundry and activity rooms) would be provided.
- Building 651. The existing barracks building would be repaired to provide improved accommodations for 50 unaccompanied enlisted personnel. Repair work to be accomplished would renovate the living/sleeping rooms, baths, walk-in closets, service areas, janitor's closets, mechanical rooms, electrical rooms and telecommunication rooms.
- Building 652. Company operations facilities with arms vaults, equipment maintenance areas, unit storage and equipment storage areas would be repaired to adequately accommodate one (1) medium company/three (3) small companies. Intrusion detection systems (IDS) would be installed in all arms vaults. A small battalion headquarters and a troop aid station would be provided.

The following buildings would be affected by repair and renovation work:

Quad B: Buildings 155, 156, 157 and 158.

Quad C: Buildings 355, 356, 357 and 358.

Quad D: Buildings 449, 450, 451 and 452.

Quad E: Buildings 549, 550, 551 and 552.

Quad F: Buildings 649, 650, 651 and 652.

According to the *Schofield Barracks Cultural Resource Management Plan* (Belt Collins Hawaii et al., 2000), the Quads located within the Schofield Barracks Historic District were evaluated as historically significant (pg. 2-5). The unique architectural character attributed to Quads B, C, D, E and F is hereby described in the following excerpts from the *Schofield Barracks Cultural Resource Management Plan* (pg. 2-8):

Quad B. These concrete Quadrangle barracks were constructed between 1914 and 1918 for the enlisted men of the 3rd Engineer and Special Troops. The buildings were designed in a Second Renaissance Revival style. Classical elements—such as arcades, arched openings, enriched cornices with decorative brackets, dentils, and a diamond frieze—are characteristic of this style. Buildings in this style are generally large, usually three stories, and organized into distinct horizontal divisions by pronounced belt or string courses. The administrative building has a central entry with a decorative concrete, brick, and plaster surround at the open passage leading to the central courtyard. The four buildings each have arcaded galleries or walkways on their courtyard elevations.

Quad C. Buildings 356 and 358 (in 1915) and buildings 355 and 357 (in 1916) were constructed as barracks for the 35th Infantry. Like the buildings in Quad B, they were designed in a Second Renaissance Revival style. (See Quad B description for additional information).

The Quad C administrative building, along Waianae Avenue, has a central entry with a decorative concrete, brick, and plaster surround at the open passage leading to the central courtyard. All four buildings have arcaded galleries or walkways on their courtyard elevations.

Quad D. These four buildings were constructed in 1921 as barracks for the 27th Infantry. (See Quad C for a general description).

The administrative building, along Waianae Avenue, has a central entry with a decorative concrete, brick, and plaster surround at the open passage leading to the central courtyard. Unlike Quads B and C, the original barracks buildings (450, 451, and 452) in this Quad are double-loaded with galleries on the courtyard and exterior elevations, and have arched openings on both sides of the buildings. The ground floor galleries at the exterior elevations were enclosed in a 1950s renovation.

Quad E. These four buildings were constructed in 1920 as barracks for the 21st Infantry. (See description of Quads C and D for additional information).

Quad F. This Quad was constructed in 1931 as the 19th Infantry barracks. The buildings were constructed in a simple utilitarian style with flat roof and cornice and little or no decorative detailing. They also do not have the arched openings at the exterior balconies seen in buildings of other Quads, but rather have rectangular openings. Quad F has the same layout as the other Quads, with three barracks buildings and single administration building around a central courtyard. All original windows and doors have been replaced, but the structures otherwise retain their original appearance.

The completion of WBR Program actions for Quads B, C, D, E and F is expected to provide up to 156,250 square meters (187,500 square yards) of usable interior space.

Currently, Quads B, C, D and E are occupied; only Quad F is vacant. WBR Program actions are expected to be coordinated to avoid displacing soldiers in off-post facilities. Other WBR Program actions (e.g., the construction of new on-post housing assets) are expected to provide the necessary facilities for the relocation of soldiers from buildings currently in use. Repair and renovation work will be coordinated to occur in an orderly fashion that minimizes the disruptions to affected personnel.

3.2 Alternative 1: Lease Existing Housing Assets Off-Post and Renovation

With this alternative, the U.S. Army would lease existing housing assets in areas surrounding Schofield Barracks Military Reservation. Renovation work on operations and support facilities would occur as described for the Proposed Action. Soldiers' quarters on Schofield Barracks Military Reservation, however, would not be renovated because the soldiers currently housed in those units would be assigned to rental units in nearby areas. The U.S. Army would provide monthly stipends to each soldier to cover expenses (i.e., rent).

3.3 Alternative 2: Purchase Existing Housing Assets Off-Post and Renovation

With this alternative, the U.S. Army would buy existing housing assets in areas surrounding Schofield Barracks Military Reservation. Renovation work on operations and support facilities would occur as described for the Proposed Action. Soldiers' quarters on Schofield Barracks Military Reservation, however, would not be renovated because the soldiers currently housed in those units would be assigned to the purchased condominium or single-family homes in nearby areas.

3.4 Alternative 3: Move to Excess Facilities on Other Installations

Operational military installations on Oahu that contain barracks include Hickam Air Force Base, Pearl Harbor and Marine Corps Base Hawaii, Kaneohe Bay. It is reported that none of these facilities can accommodate the Army unaccompanied housing requirement (Department of the Army, 1995, pg. 3-2). This fact, when considered with the transfer of uses formerly housed at the recently closed Barber's Point Naval Air

Station to other installations such as the Marine Corps Base Hawaii, Kaneohe Bay or Hickam Air Force Base further limits the availability of excess facilities on other installations. The Army is not expected to utilize the vacated air station as a result of its transfer to the State of Hawaii. In light of these considerations, the alternative to move to excess facilities on other installations is not regarded as a viable alternative and it is hereby dismissed from further consideration.

3.5 Alternative 4: Maintain the Status Quo (No Action)

With no action, existing conditions at Schofield Barracks Military Reservation remain unchanged. Currently, single enlisted soldiers are housed in substandard barracks buildings that lack proper plumbing, lighting, ventilation, and partitions for security, privacy, comfort and noise abatement. In addition, the configuration and organization of existing barracks do not meet current Army WBR Program standards that separate billeting from unit operations and headquarters facilities. For all of these reasons, the no action alternative is not a viable alternative and is hereby dismissed from further consideration.

SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 4.0 AFFECTED ENVIRONMENT

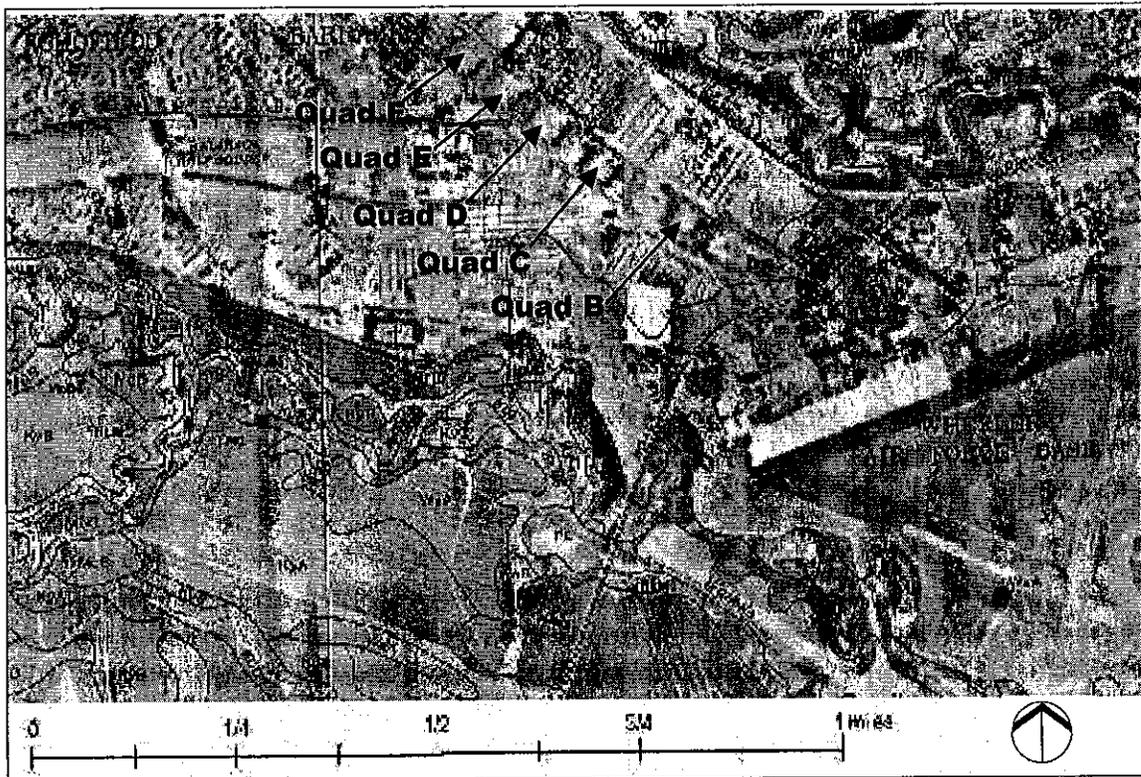
4.1 Topography, Soils and Geology

Refer to Sections 4.1 and 4.1.1 of the *Final Programmatic EA* (pgs 4-1 to 4-3) for relative information pertaining to the affected topography, soils and geology at Schofield Barracks Military Reservation. Additional site-specific information is hereby provided.

The Quads are located on the Main Post of Schofield Barracks Military Reservation where the topography is relatively flat. Slight variations in elevation are localized. The general area lies within the range of 840 and 880 feet above mean sea level.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* (U.S. Department of Agriculture, Soil Conservation Service, 1972), the soil type underlying the Quads is Kunia silty clay, 0 to 3 percent slopes (KyA). This series consists of well-drained soils on the upland terraces and fans of Oahu. The soils are used for sugarcane, pineapple, homesites and military reservations. The KyA soil type has moderate permeability and slow runoff. The erosion hazard is no more than slight.

Figure 5: Soils



Source: Oahu Island, Hawaii - Sheet 41 (U.S. Department of Agriculture, Soil Conservation Service, 1972).

4.2 Water Resources

Refer to Sections 4.2 and 4.2.1 of the *Final Programmatic EA* (pgs. 4-6 to 4-12) for the discussion of water resources on Oahu and at Schofield Barracks Military Reservation, respectively. The water resources discussion in Section 4.2.1 covers surface water, ground water and flood hazards. Site-specific information is hereby provided.

There are no major surface water features in the project area containing Quads B, C, D, E and F. With respect to the flood hazard, the Quads fall (along with all of Schofield Barracks Military Reservation) within Zone D on the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM). Zone D is a classification for areas in which flood hazards are undetermined (FEMA, 1990). As depicted on available topographic maps, the project area is generally flat and not traversed by natural drainageways such as streams. Nevertheless, the Army considers Schofield Barracks Military Reservation as an area of possible but undetermined flood potential (Department of the Army, 1983). The risks from tsunamis are of lesser concern because Schofield Barracks Military Reservation is situated a considerable distance from the coastline and lies well outside the tsunami inundation zone.

4.3 Flora and Fauna

Refer to Sections 4.3 and 4.3.2 of the *Final Programmatic EA* (pgs. 4-18 to 4-23) for the discussion of flora and fauna at WBR project sites and at Schofield Barracks Military Reservation, respectively. Quads B, C, D, E and F are located on the main cantonment area of Schofield Barracks Military Reservation which does not contain suitable habitats for endangered, threatened or listed endangered or threatened species of flora or fauna.

Ornamental species found in urbanized areas are present in the project area. The species that were observed in the vicinity of Quad F are listed below; similar species exist in the vicinity of the remaining Quads.

COMMON NAME	BOTANICAL NAME
Palms:	
Royal Palm	<i>Roystonea elata</i>
Coconut Palm	<i>Cocos nucifera</i>
Areca Palm	<i>Dyopsis lutescens</i>
Fan Palm	<i>Livingstonia chinensis</i>
Manila Palm	<i>Veitchia merrillii</i>
Trees:	
Monkeypod	<i>Samanea saman</i>
Brassia	<i>Brassica spp.</i>
Chinese Banyan	<i>Ficus Microcarpa</i>
Benjamina Banyan	<i>Ficus benjamina</i>
Eucalyptus	<i>Eucalyptus robusta</i>
Earpod	<i>Enterolobium cyclocarpum</i>
Norfolk Island Pine	<i>Araucaria columnaria</i>

COMMON NAME	BOTANICAL NAME
Shrubs:	
Cactus (prickly pear)	<i>Optuna ficus-indica</i>
Mock Orange	<i>Murray paniculata</i>
Hibiscus	<i>Hibiscus tiliaceus</i>
Bouganvillea	<i>Bouganvillea spp.</i>
Grasses:	
Common Bermuda	<i>Cynodon datctylon manienie</i>

4.4 Air Quality

The discussion of climate, regulatory standards and ambient air quality is provided in Sections 4.4 through 4.4.3 of the *Final Programmatic EA* (pgs. 4-25 to 4-28). Hawaii, in general, has air that is "relatively clean and low in pollution" (Univ. of Hawaii, Dept. of Geography, 1983). On Schofield Barracks Military Reservation, minor localized impacts to air quality probably occur as a result of nearby aircraft operations, fuel transfers, motor vehicle traffic, laundry operations, and automotive care operations; however, it is presumed that both state and federal ambient air quality standards are being met.

4.5 Noise Quality

The discussion of noise quality (including applicable criteria) is provided in Section 4.5 through 4.5.2 of the *Final Programmatic EA* (pgs. 4-28 to 4-32). Quads B, C, D, E and F lie well within Noise Zone I on Schofield Barracks Military Reservation (which implies that noise quality in the project area is at an acceptable level for noise sensitive land uses such as housing).

4.6 Historic and Archaeological Resources

Refer to Section 4.6.1 of the *Final Programmatic EA* (pgs. 4-36 to 4-37) for the discussion of historical and archaeological resources at Schofield Barracks Military Reservation. Site-specific information is hereby provided.

Schofield Barracks Military Reservation is considered significant because of its size, its involvement in World War II and its physical characteristics (Belt Collins Hawaii et al., 2000, pg. 2-1). Quads B, C, D, E and F were constructed between 1914 and 1931 and are located within the Schofield Barracks Historic District that was listed on the State and National Register of Historic Places in September 1997 and July 1998, respectively. The last major renovation occurred in the 1970s and involved renovation of the building interiors and exterior windows and doors.

Although Quads C, D, E, and F form the nucleus of the district, the *Schofield Barracks Cultural Resource Management Plan* (Belt Collins Hawaii et al., 2000, pgs. 4-6 to 4-14)

indicates that the Quads can be renovated and retained for operational needs of the military when specific criteria are met and Section 106 consultation is completed.

No significant subsurface archaeological or cultural deposits are expected to be present at the Quads since they all lie within urbanized areas. The results of an archaeological survey and subsurface testing conducted for the *Final Programmatic EA* indicates a low probability for the occurrence of unrecorded archeological sites, particularly in developed portions of Schofield Barracks Military Reservation due to destructive land use patterns during the premodern period (Ogden Environmental and Energy Services Co., Inc., 1997, pg. 29). Prior to Army use, the area was used for ranching, for commercial agriculture and probably for continuing subsistence agriculture (Ibid). With the development of Army facilities and especially during the intensive World War II buildup, the landscape in the project area underwent extensive alterations and modifications that may have destroyed most traces of earlier use (Ibid).

4.7 Aesthetics

Refer to Section 4.7.1 of the *Final Programmatic EA* (pgs. 4-43 to 4-44) for a discussion of aesthetics at Schofield Barracks Military Reservation. Site-specific information is hereby provided.

Each Quad consists of four buildings arranged around a large open space used for recreation and training. The architectural integrity and exterior facades of the buildings are significant features to be preserved because the Quads lie within an historic district. Plates 1 through 4 depict the style and character of buildings in Quad F. Quads B, C, D and E exhibit a comparatively similar architectural style and character to that of Quad F since all buildings were constructed within the same relative period of time.

Plate 1: Building 649, View Facing East From Courtyard



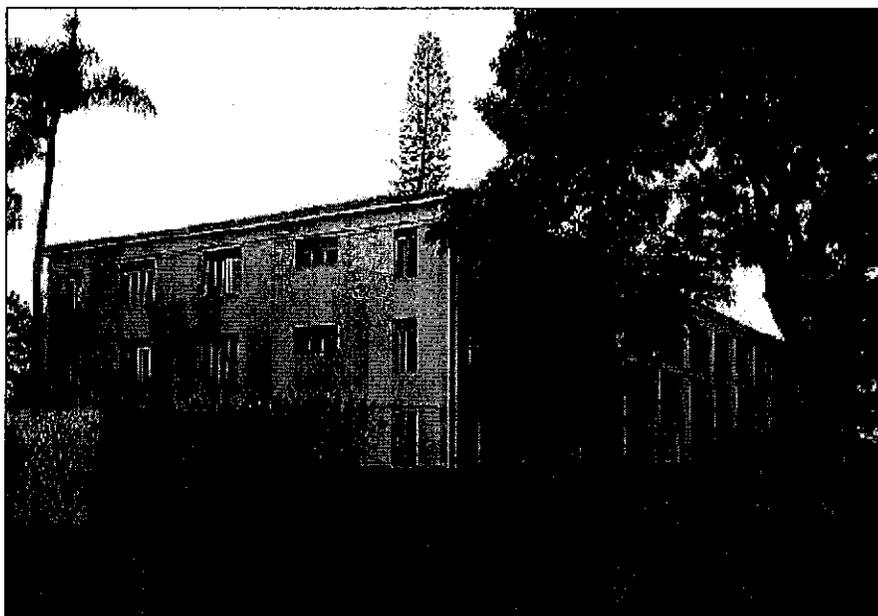
Plate 2: Building 650, View Facing Northwest



Plate 3: Building 651, View Facing South From Glennan St.



Plate 4: Building 652, View Facing North



4.8 Socioeconomics

Refer to Section 4.8.1 of the *Final Programmatic EA* (pgs. 4-47 to 4-52) for the discussion of socioeconomics (including population, housing, local business and quality of life).

4.9 Land Use Plans and Policies

Refer to Sections 4.9 and 4.9.1 of the *Final Programmatic EA* (pgs. 4-52 to 4-59) for the discussion of land use plans and policies on Army installations and at Schofield Barracks Military Reservation, respectively. Site-specific information is hereby provided.

The buildings comprising Quads B, C and D are designated on the Long-Term Land Use Plan for Schofield Barracks Military Reservation as troop housing (TR) whereas the buildings comprising Quads E and F are designated as family housing (FH). The open space at the center of each Quad is designated as outdoor recreation (OR).

The Quads are situated on Federal land whereby State and City land use designations are not enforceable. Nevertheless, the State land use designation for the project sites is Urban. The City and County of Honolulu zoning designation for all of Schofield Barracks Military Reservation is Military and Federal; the Development Plan designation for the area containing Quads B, C, D, E and F is Medium Density Apartments. The Quads do not lie within the City's Special Management Area.

4.10 Hazardous and Toxic Materials/Wastes

Refer to Sections 4.10 and 4.10.1 of the *Final Programmatic EA* (pgs. 4-62 to 4-64) for the discussion of hazardous and toxic materials/wastes as they pertain (from a regulatory perspective) to Hawaii and to WBR project sites at Schofield Barracks Military Reservation, respectively. Site-specific information is hereby provided.

Quads B, C, D, E and F were constructed between 1915 and 1931 when lead and asbestos containing materials (ACM) were widely used and the detrimental effects of such materials were not known. The hazards associated with lead and ACM must therefore be addressed before repair or renovation work may begin.

Existing buildings in the Quads are used for billeting, dining, operations, administration and support functions. Concerns pertaining to hazardous and toxic materials storage or usage, or hazardous waste generation or management (i.e., treatment, storage, disposal, or reclamation) include small amounts of solvents, petroleum products or other washing solutions used for equipment operation or maintenance in company operations facilities. Heating fuel USTs (which are not regulated) may also be present in the Quads. Radioactive materials are associated with the arms facility in Building 652 (refer to Plate 5). Flammable gas is present in Building 652 (refer to Plate 6).

Plate 5: Arms Room at Building 652 with Radioactive Materials Caution Sign

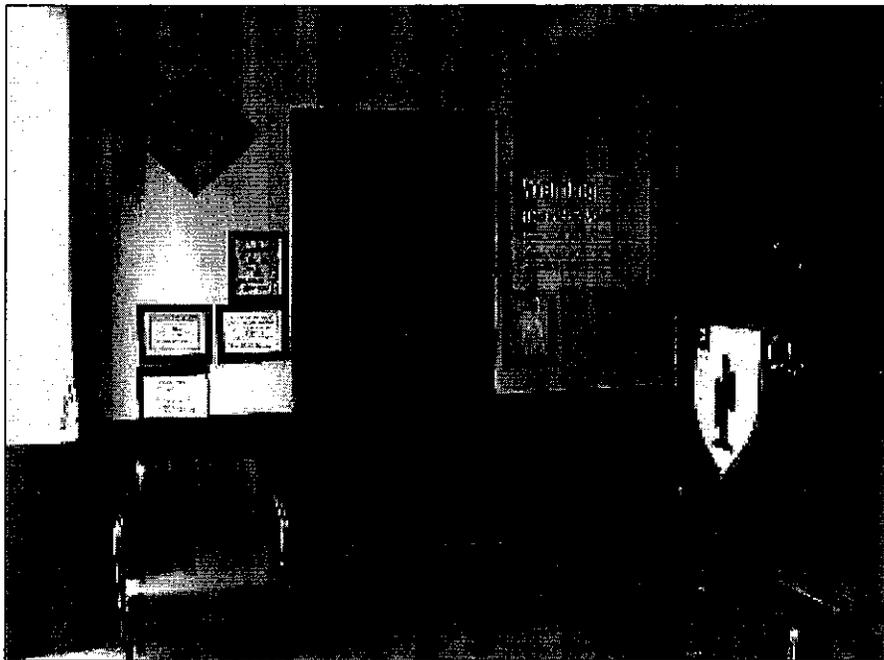


Plate 6: Flammable Gas Mark on Door to Room at Southwest End of Building 652



4.11 Circulation and Traffic

Refer to Section 4.11.1 of the *Final Programmatic EA* (pgs. 4-65 to 4-68) for the discussion of circulation and traffic at Schofield Barracks Military Reservation. Site-specific information is hereby provided.

Four roadways bound the affected area and provide vehicular access to the Quads: Foote Avenue, Glennan Street, Waianae Avenue and Devol Street. Foote and Waianae Avenues are parallel primary connectors and two of the most traveled roadways on Schofield Barracks Military Reservation (Department of the Army, 1995, pg. 4-66). Cross streets between the Quads include Lewis Street, Heard Avenue, Kolekole Avenue and Meigs Avenue.

Peak hour traffic along Foote and Waianae Avenues was reportedly congested (Belt Collins and Associates, 1993); however, intersections involving these roadways were not identified as having unacceptable levels of service. Traffic recommendations such as road realignments, extensions, widening, and closures to support future land-use changes at Schofield Barracks Military Reservation are being implemented to coordinate with land use changes and facility projects.

Traffic control within the Main Post of Schofield Barracks Military Reservation is provided as needed with devices such as stop signs and signals or with personnel directing the traffic flow. For all of these reasons, it is generally presumed that circulation and traffic on Schofield Barracks Military Reservation and in the vicinity of the Quads is acceptable and manageable.

4.12 Water Supply System

Refer to Section 4.12.1 of the *Final Programmatic EA* (pg. 4-70) for the discussion of the water supply system at Schofield Barracks Military Reservation. Existing water lines and mains are typically aligned along the major streets and roadways in the vicinity of the project sites.

4.13 Wastewater Facilities

Refer to Section 4.13.1 of the *Final Programmatic EA* (pgs. 4-73 to 4-74) for the discussion of the wastewater facilities at Schofield Barracks Military Reservation. Existing sewer lines and mains are typically aligned along the major streets and roadways in the vicinity of the project sites.

4.14 Solid Waste System

The disposal of solid waste (including green waste and ordnance items) is discussed in Section 4.14 of the *Final Programmatic EA* (pg. 4-77). As mentioned in the *Final Programmatic EA*, the Army strives to minimize its waste stream through waste reduction strategies such as recycling, waste reduction and reuse (Ibid).

4.15 Power and Communications

Refer to Section 4.14.1 of the *Final Programmatic EA* (pg. 4-77) for the discussion of power and communications at Schofield Barracks Military Reservation. Power and communications service is supplied to the project sites via a combination of overhead and underground lines.

4.16 Public Services (Police, Fire, Health, Outdoor Recreation)

The discussion of police, fire, health, and outdoor recreation facilities at the affected Army installations is provided in Sections 4.16.1 through 4.16.4 of the *Final Programmatic EA* (pgs. 4-79 to 4-82). Site-specific information is hereby provided.

The Physical Security Section office at Schofield Barracks Military Reservation is located in Building 690 at the end of Glennan Street in the vicinity of Redlander Field. A Fire Station (S494) is located near the intersection of Kolekole and Heard Avenues. A health clinic, dental clinic, and urgent care clinic are located in a facility situated along Glennan Street and opposite Quad F. The Quads also have smaller troop clinics. Parks and recreational facilities within a mile of the Quads include ball fields, a bowling alley, a craft shop, the physical fitness center, a sports dome, a swimming pool, the tennis center, a theater and a woodworking craft center.

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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 5.0 ENVIRONMENTAL CONSEQUENCES

5.1 Topography, Soils and Geology

The discussion of significance criteria pertaining to the topography, soils and geology is hereby excerpted from the *Final Programmatic EA* (pg. 5-1). Project actions are determined to have a significant adverse environmental impact if the following consequences occur: major changes are made to the topography; increased soil erosion and resulting sedimentation reduces ground water quality below existing standards; or people and/or property are exposed to geologic hazards (i.e., earthquakes, landslides, mud slides or ground failure).

5.1.1 The Proposed Action: Repair and Renovate Existing Assets. No major changes to the topography would occur as a result of repair and renovation work. Ground disturbing activities (e.g., excavation, trenching) are expected to be accomplished only to the extent necessary to repair and/or replace obsolescent plumbing systems and related subsurface infrastructure systems. The nature of repairs may have minor, short-term erosion and sedimentation impacts.

With respect to earthquakes, all of Oahu lies within an earthquake zone classified as Seismic Zone 2A; Zone 0 refers to areas with least seismic activity whereas Zone 4 denotes an area with greatest seismic activity. Earthquakes are natural occurrences that have the potential to affect the affected property and building. The threat from these hazards will always exist because humans have little control over the frequency and intensity of an unpredictable event. Nevertheless, public and certain types of private buildings must conform to structural design standards for earthquake resistance per the Uniform Building Code (UBC) Requirements for Seismic Zone 2A.

MITIGATION: Standard erosion control measures will be implemented during ground disturbing activities to minimize erosion impacts. Any soils that are exposed during excavation or trenching would be revegetated or otherwise covered with an impermeable surface as soon as practicable. The Proposed Action will comply with regulations for protection from seismic hazards such as adherence to the UBC standards (as amended by the City and County of Honolulu) and Occupational Safety and Health Administration (OSHA) excavation standards. The need for seismic retrofitting will be determined from a condition assessment of the buildings in Quads B, C, D, E and F by an architect who has considerable historic preservation experience (refer to Section 5.6.1). The seismic work must be accomplished under the supervision of the architect who has considerable historic preservation experience per Section 106 consultation.

5.1.2 Alternative 1: Lease Off-Post Assets and Renovation. Similar impacts as discussed for the Proposed Action would occur, but to a lesser extent since no repair or renovation of barracks would occur. Only operations and support facilities would be renovated.

MITIGATION: The measures are the same as for the Proposed Action.

5.1.3 Alternative 2: Purchase Off-Post Assets and Renovation. Similar impacts as discussed for the Proposed Action would occur, but to a lesser extent since no repair or renovation of barracks would occur. Only operations and support facilities would be renovated.

MITIGATION: The measures are the same as for the Proposed Action.

5.2 Water Resources

The measure of significant impacts to water resources is discussed in the *Final Programmatic EA* (pg. 5-4). Project actions are determined to have a significant adverse environmental impact if the following consequences occur: absorption rates, drainage patterns or surface runoff volumes and velocities change; surface or ground water quality deteriorates below regulatory standards; water demand increases beyond sustainable consumption levels; area available for ground water recharge is reduced; or people and property become exposed to water-related hazards such as flooding.

5.2.1 The Proposed Action: Repair and Renovate Existing Assets. Proposed repair and renovation work is expected to have no major impact on water resources, especially since these types of resources (e.g., streams or major drainageways) do not exist at the project sites. Repair and renovation will result in no new large open areas being replaced with impermeable surfaces. Repair and renovation work may generate surface runoff if it rains heavily during ground disturbing activities (i.e., excavation, trenching), but this impact would be minor and temporary. The runoff would need to be controlled at the project site. In the long-term, man-made drainage systems at the project sites will be maintained and repaired or replaced as necessary. Proper maintenance of all drainage devices and systems at the project site is expected to minimize the threats to people and property from the (undetermined) flooding hazard.

No increase in water consumption is anticipated since project actions would relocate personnel who are already drawing from the same water source. Any perceived increase in water consumption resulting from the creation of more private living quarters is expected to be minimized by the use of water-saving devices as promulgated by the 1991 Uniform Plumbing Code, Section 1010, Water Conservation.

MITIGATION: No mitigation is required.

5.2.2 Alternative 1: Lease Off-Post Assets and Renovation. With Alternative 1, similar impacts as described for the Proposed Action would occur, with the exception that water consumption levels at Schofield Barracks Military Reservation may marginally decrease as soldiers move to off-post housing. Soldiers occupying leased units in the surrounding communities would impact private or municipal water systems. Ultimately, the same hydrological system provides the water source for the water supply systems of the Army, municipality and private entities in the area surrounding the installation.

MITIGATION: No mitigation is required.

5.2.3 Alternative 2: Purchase Off-Post Assets and Renovation. Similar impacts as described for the Proposed Action would occur, with the exception that water consumption levels at Schofield Barracks Military Reservation may marginally decrease. Private or municipal water systems are expected to be affected by the soldiers who occupy purchased units off-post.

MITIGATION: No mitigation is required.

5.3 Flora and Fauna

Significance criteria with respect to flora and fauna are discussed in the *Final Programmatic EA* (pg. 5-9). Project actions are determined to have a significant adverse environmental impact on the flora if the following consequences occur: disturbances or removal of native vegetation, threatened or endangered species, or trees included on the City and County of Honolulu Exceptional Tree List. Significance criteria used to determine the extent of impacts to wildlife species includes the extent of habitat loss or gain, and the presence or absence of threatened, endangered or protection species including migratory avifauna. The loss of sensitive habitat is indicative of significant impacts, whereas minor relocation and/or modification of habitats are indicative of adverse but not significant impacts.

5.3.1 The Proposed Action: Repair and Renovate Existing Assets. No threatened, endangered, or protected species of flora or fauna are known to exist at Quads B, C, D, E and F (which are all highly urbanized sites). Ornamental flora species disturbed during repair and renovation work are expected to be replanted or replaced.

MITIGATION: No mitigation is required.

5.3.2 Alternative 1: Lease Off-Post Assets and Renovation. Similar impacts as described for the Proposed Action would occur, but to a lesser degree since no repair or renovation of on-post housing assets would occur. Only operations and support facilities would be renovated.

MITIGATION: No mitigation is required.

5.3.3 Alternative 2: Purchase Off-Post Assets and Renovation. Similar impacts as described for the Proposed Action would occur, but to a lesser degree since no repair or renovation of on-post housing assets would occur. Only operations and support facilities would be renovated.

MITIGATION: No mitigation is required.

5.4 Air Quality

Significance criteria pertaining to air quality are discussed in the *Final Programmatic EA* (pgs. 5-12 to 5-13). Project actions are determined to have a significant adverse environmental impact on air quality if the following consequences occur: potential air emission concentrations predicted to occur from the implementation of a proposed project combined with the ambient concentrations for criteria pollutants exceed State or Federal Ambient Air Quality Standards (AAQS).

5.4.1 The Proposed Action: Repair and Renovate Existing Assets. The impacts of repair and renovation work that may generate fugitive dust and air pollutant emissions from heavy equipment or workers' vehicles are expected to be localized and temporary. As a result of modernization, project actions are expected to employ energy conservation measures that will minimize emissions from electrical power generation. For example, the Army will utilize passive solar water heating systems, low pollutant-emitting systems for water heating and integrated energy systems that serve more than one dwelling with a centralized unit, as applicable and appropriate. Other measures that can conserve energy include the avoidance of large glass areas, the efficient use of shading, the deliberate placement of high usage rooms to avoid summer heat and the proper use of attic fans or other ventilation systems. Maximizing natural light will also help to minimize electricity usage. Air quality impacts attributed to project actions are therefore considered to be insignificant.

The positive impact of project actions would be the potential decrease of vehicular emissions from commutes between the residence and work site.

MITIGATION: Fugitive dust control measures will be implemented during repair/renovation work in compliance with State and county requirements.

5.4.2 Alternative 1: Lease Off-Post Assets and Renovation. Similar impacts as described for the Proposed Action would occur, but to a lesser degree since no repair or renovation of on-post housing assets would occur. Housing soldiers in leased off-post units may increase their commuting distance, thereby increasing pollutant vehicular emissions as compared to the Proposed Action.

MITIGATION: Mitigation is the same as for the Proposed Action.

5.4.3 Alternative 2: Purchase Off-Post Assets and Renovation. Similar impacts as described for the Proposed Action would occur, but to a lesser degree since no repair or renovation of on-post housing assets would occur. Housing soldiers in purchased off-post units may increase their commuting distance, thereby increasing pollutant vehicular emissions as compared to the Proposed Action.

MITIGATION: Mitigation is the same as for the Proposed Action.

5.5 Noise Quality

The discussion of significance criteria pertaining to noise quality is hereby excerpted from the *Final Programmatic EA* (pg. 5-16). Project actions are determined to have a significant adverse environmental impact on air quality if on-site operational noise levels exceed 65 Ldn. Moreover, project actions that generate noise exceeding 65 Ldn would have a significant impact on sensitive noise receptors (i.e., schools, residences, etc.).

5.5.1 The Proposed Action: Repair and Renovate Existing Assets. Noise generated by repair and renovation work is expected to be temporary and intermittent due to the nature of proposed work that would be accomplished primarily during daylight hours in accordance with curfew periods similar to those of the State Department of Health (DOH) permit system to avoid the nuisance to sensitive noise receptors. Anticipated short-term noise impacts from repair and renovation work are therefore not considered a threat to public health and welfare. In the long-term, project actions would not introduce new major noise sources to the area since proposed uses (e.g., barracks, operational facilities) have occurred at the project sites from as early as 1915. Furthermore, project actions are not expected to increase traffic volumes or increase traffic-related noise levels to a significant degree.

MITIGATION: No mitigation is required.

5.5.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur.

MITIGATION: No mitigation is required.

5.5.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur.

MITIGATION: No mitigation is required.

5.6 Historic and Archaeological Resources

Legislation and regulations pertaining to the treatment and consideration of historic and archaeological resources include Section 106 of the National Historic Preservation Act of 1966 (P.L. 89-665), as amended and its implementing guidelines in 36 CFR Part 800; Title 36 CFR 60.4; *Army Regulation 200-4, Cultural Resources Management* (Department of the Army, 1998); U.S. Army Technical Manual *TM 5-801-1* (November 1975); and U.S. Army Technical Manual *TM 5-801-2* (February 1977). The following paragraphs describe the applicable legislation and regulations.

Section 106 of the National Historic Preservation Act of 1966, as amended is designed to ensure that historical properties (i.e., significant cultural resources) are considered during federal project planning and execution.

Title 36 CFR 60.4 defines the criteria to be used in determining significance and National Register eligibility.

Army Regulation 200-4, Cultural Resources Management is the Army's policy for managing cultural resources to meet legal compliance requirements and to support the military mission.

U.S. Army Technical Manual TM 5-801-1 provides additional background on the identification, evaluation, and treatment of historic resources.

U.S. Army Technical Manual TM 5-801-2 specifies maintenance procedures for the preservation of historic properties.

The Schofield Barracks Historic District is a priority for preservation because it contains numerous significant properties within a contiguous historic setting. The Preservation Program that includes recommendations for adaptive reuse of existing historic properties and treatment recommendations for specific architectural resources at the installation is contained in Chapter 4 of the *Schofield Barracks Cultural Resource Management Plan* (Belt Collins Hawaii et al., 2000, pgs. 4-1 to 4-31). The Army has established modification limitations for significant architectural properties that are intended to ensure that no irreversible alteration is made to a historic property without approval by the proper authorities. These modification limitations are defined on pages 4-3 to 4-4 of the *Schofield Barracks Cultural Resource Management Plan*.

5.6.1 The Proposed Action: Repair and Renovate Existing Assets. The Army has initiated Section 106 consultation with the Hawaii State Historic Preservation Division (SHPD) (refer to Appendix A). The Hawaii State Historic Preservation Officer (SHPO) concurred with the Army's determination that the Quads are significant historic properties within the Schofield Barracks Historic District and that proposed renovations to the Quads would have an adverse effect (refer to Appendix A). The SHPO concluded that mitigation of this adverse effect could be developed in a Programmatic Agreement between the Army, SHPD, the Historic Hawaii Foundation and the Advisory Council on Historic Preservation.

MITIGATION: A Programmatic Agreement will be developed in consultation with the State Historic Preservation Officer, Historic Hawaii Foundation and the Advisory

Council on Historic Preservation. A Historic Structures Report that identifies significant architectural elements that must be retained in interior or exterior renovations and determines structural integrity of the buildings will be completed. An Architect of Record who has considerable historic preservation experience will be actively involved in the design and construction of each renovation.

5.6.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur.

MITIGATION: The measures are the same as for the Proposed Action.

5.6.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur.

MITIGATION: The measures are the same as for the Proposed Action.

5.7 Aesthetics

The measure of significant impacts to aesthetic resources is discussed in the *Final Programmatic EA* (pgs. 5-23 to 5-24). Project actions are determined to have a significant adverse environmental impact if the following consequences occur: natural resources of high scenic quality are directly affected; the visual/aesthetic setting of designated park or recreation areas that depend on the landscape setting are directly or indirectly affected; project actions result in structures that contrast sharply in line, form, color, scale and texture with existing facilities and other elements of the landscape; or project actions create a long-term inconsistent image of the existing facility from public viewpoints such as from public areas and major roadways.

5.7.1 The Proposed Action: Repair and Renovate Existing Assets. Concerns pertaining to aesthetic resources will be addressed as a result of mitigation intended to preserve and protect the important features and characteristics of the Schofield Barracks Historic District. Repair and renovation work is expected to improve the overall appearance of affected buildings and the resulting effect is considered a benefit.

MITIGATION: As previously indicated in Section 5.6, a Programmatic Agreement will be developed in consultation with the State Historic Preservation Officer, Historic Hawaii Foundation and the Advisory Council on Historic Preservation. A Historic Structures Report that identifies significant architectural elements that must be retained in interior or exterior renovations and determines structural integrity of the buildings will be completed. An Architect of Record who has considerable historic preservation experience will be actively involved in the design and construction of each renovation.

5.7.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur. Buildings that are not repaired or renovated may result in an adverse impact if the architectural appearance or structural integrity of these buildings is allowed to deteriorate over time.

MITIGATION: The measures are the same as for the Proposed Action.

5.7.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action but the degree of impact would be less since no repair or renovation of living quarters would occur. Buildings that are not repaired or renovated may result in an adverse impact if the architectural appearance or structural integrity of these buildings is allowed to deteriorate over time.

MITIGATION: The measures are the same as for the Proposed Action.

5.8 Socioeconomics

Significance criteria with respect to socioeconomic considerations are discussed in the *Final Programmatic EA* (pg. 5-26). Project actions may have either a beneficial or detrimental impact social and economic impact as determined by the changes to housing demand, employment, local business, standard of living (including retention and morale), access to recreation and compatibility of the project with its surroundings. Of particular interest are situations in which the residents of surrounding communities (e.g., Millilani, Wahiawa) feel that adverse impacts would result from project actions.

5.8.1 The Proposed Action: Repair and Renovate Existing Assets. The proposed action is intended to improve the living conditions for soldiers whereby morale, retention rates and unit readiness would be positively affected. Completion of proposed repair and renovation work is expected to facilitate the redistribution of soldiers currently occupying on-post barracks to Quads B, C, D, E and F to prevent their displacement to off-post housing in the surrounding communities.

Employment opportunities would be created from project actions to repair and renovate the existing Quads. A substantial portion of labor and materials utilized for project actions is expected to be supplied by local business. The surrounding communities have generally expressed support for WBR Program actions with many residents indicating that the program is in the best interests of community and soldiers.

MITIGATION: No mitigation is required.

5.8.2 Alternative 1: Lease Off-Post Assets and Renovation. This alternative would generate similar positive impacts as discussed for the Proposed Action; however, fewer employment opportunities would be created since existing on-post housing assets

would not be repaired or renovated. Displaced personnel (from on-post to off-post housing) would represent a change of less than one percent of the total populations of Wahiawa and Mililani (consisting of approximately 48,000 persons), whereby project actions under Alternative 1 should not greatly impact the demographic character of affected communities. As noted in Section 3.2, Alternative 1 would scatter personnel throughout communities surrounding Schofield Barracks Military Reservation, thereby contributing to the deterioration of unit integrity and unit readiness, slower response times during emergencies, and greater coordination and communication needs.

MITIGATION: No mitigation is required.

5.8.3 Alternative 2: Purchase Off-Post Assets and Renovation. This alternative would generate similar positive impacts as discussed for the Proposed Action; however, fewer employment opportunities would be created since existing on-post housing assets would not be repaired or renovated. Displaced personnel would represent a change of less than one percent of the total populations of Wahiawa and Mililani, whereby project actions under Alternative 2 should not greatly impact the demographic character of affected communities. As noted in Section 3.3, Alternative 2 would scatter personnel throughout communities surrounding Schofield Barracks Military Reservation, thereby contributing to the deterioration of unit integrity and unit readiness, slower response times during emergencies, and greater coordination and communication needs.

MITIGATION: No mitigation is required.

5.9 Land Use Plans and Policies

Significance criteria pertaining to land use plans and policies are discussed in the *Final Programmatic EA* (pg. 5-32). Project actions are determined to have a significant short-term adverse impact on land use if access or operation of an adjacent or nearby land use activity is disrupted to the extent that a major alteration in the activity would be required. Disruptions that are temporary in nature that do not alter the activity function are considered insignificant. Project actions are determined to have a significant long-term adverse impact on land use if the activity is incompatible and conflicts with the surrounding land use. Noncompliance of the proposed project with the governing land use plans and policies is also considered to be a significant adverse land use impact.

5.9.1 The Proposed Action: Repair and Renovate Existing Assets. The completion of project actions would result in land uses that currently exist at Quads B, C, D, E and F. Billeting, unit operations, administration and community support functions are compatible with surrounding land uses and consistent with the long-term land use plans and policies for Schofield Barracks Military Reservation.

MITIGATION: No mitigation is required.

5.9.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action. No mitigation is required.

MITIGATION: No mitigation is required.

5.9.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action. No mitigation is required.

MITIGATION: No mitigation is required.

5.10 Hazardous and Toxic Materials/Wastes

The discussion of significance criteria pertaining to the hazardous and toxic materials/wastes is hereby excerpted from the *Final Programmatic EA* (pg. 5-34). The potential for significant exposure is dependent on the characteristics of the chemical(s) of concern, the concentration(s) at which they are found in the environment and the routes of exposure for those contaminants. Project actions are determined to have a significant adverse environmental impact if the public or the environment is exposed to toxic and hazardous materials that exceed background conditions or regulatory requirements (e.g., EPA Preliminary Remediation Goals, DOH criteria). Significant impacts would also occur if project actions generated toxic or hazardous materials in a manner that neglected public and environmental safety.

5.10.1 The Proposed Action: Repair and Renovate Existing Assets. Buildings in the Quads may contain lead-based paint and ACM due to their age. As a result, the concerns associated with the Proposed Action include the generation of debris such as lead-based paint and asbestos during repair and renovation work.

Hazardous materials (e.g., solvents used for equipment maintenance and operation, flammable gas, radioactive materials stored in arms vaults) that may be present at the project sites have the potential to be spilled or otherwise released if they are not properly handled; however, these hazardous and toxic materials (HTM) are expected to be properly removed or disposed prior to repair and renovation work in accordance with appropriate standards. In the long-term, small amounts of HTM may be used or stored in operations areas or in the arms vaults located at the Quads. Heating fuel USTs may also be present in the Quads.

MITIGATION: Quads B, C, D, E and F must be tested for lead and ACM prior to the start of any repair or renovation work. If lead or asbestos is encountered, handling and disposal will be accomplished in accordance with appropriate OSHA standards, Federal Asbestos Hazardous Emergency Response Act and Chapter 324P Hawaii Revised Statutes. Storage and handling of hazardous materials will be accomplished in accordance with the applicable standards pertaining to those materials. Any existing heating fuel USTs will be replaced with propane systems or above-ground storage tanks (ASTs).

A spill response plan will be prepared in accordance with regulatory requirements and personnel will be knowledgeable in the use of on-site spill response equipment that will be used for immediate containment and removal of any released materials.

5.10.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action.

MITIGATION: The measures are the same as for the Proposed Action.

5.10.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action.

MITIGATION: The measures are the same as for the Proposed Action.

5.11 Circulation and Traffic

Significance criteria with respect to circulation and traffic are discussed in the *Final Programmatic EA* (pgs. 5-37 to 5-38). Project actions are determined to have a significant adverse if the project results in a traffic increase that is substantial in relation to the existing traffic load and capacity of the street system. For residential parking areas, insufficient numbers of parking stalls as specified in the design guidelines is considered to be a significant impact. Furthermore, project activities that conflict with existing or proposed pedestrian access are considered to be potentially significant.

5.11.1 The Proposed Action: Repair and Renovate Existing Assets. Short-term traffic impacts may occur during repair and renovation work as a result of heavy equipment operations and the mobilization of workers at the project sites. Potential short-term traffic impacts are expected to be intermittent and therefore insignificant. In the long-term, the project would result in no operational impacts on circulation patterns. The completion of project actions may in fact improve circulation for both civilian and military personnel since soldiers housed at Schofield Barracks Military Reservation would have shorter or no commutes between their living quarters, work and community support facilities. As indicated in Section 4.11, the installation master plan includes improvements to traffic patterns internally and between facilities, whereby the project would have no long-term effect on traffic (Department of the Army, 2000).

MITIGATION: A Traffic Control Plan will be prepared and incorporated as a project design feature to mitigate potential traffic and circulation impacts during repair and renovation work. The plan will include (but not be limited to) detouring, lane closures, flagging operations and construction times, ongoing ingress and egress for adjacent uses, safety precautions to maintain safe access to residents and pedestrians around or near activities and procedures to maintain adequate access to surrounding facilities during work periods.

5.11.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, soldiers living off-post would still commute between their living quarters and on-post destinations. The slight increase in vehicular traffic entering/exiting the installation is expected to be insignificant.

MITIGATION: The measures are the same as for the Proposed Action.

5.11.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, soldiers living off-post would still commute between their living quarters and on-post destinations. The slight increase in vehicular traffic entering/exiting the installation is expected to be insignificant.

MITIGATION: The measures are the same as for the Proposed Action.

5.12 Water Supply System

The measure of significant impacts to the water supply system is discussed in the *Final Programmatic EA* (pgs. 5-41 to 5-42). Project actions are determined to have a significant adverse environmental impact if the water demand generated by the project exceeds the capacity of water distribution systems and/or water supplies operated by the Army or City and County of Honolulu. A significant impact may also occur if the water allotment permitted by the Department of Land and Natural Resources (DLNR) for an applicable facility does not meet the projected water needs of proposed activities. Adverse but insignificant impacts are associated with major expansion of existing water distribution lines. Adverse, short-term, insignificant impacts are associated with the relocation of existing distribution lines during the duration of proposed work. Negligible impacts are associated with project actions requiring only line extensions that tie into existing distribution lines without requiring line improvements.

5.12.1 The Proposed Action: Repair and Renovate Existing Assets. No water demand increase and no significant impacts to water system services are anticipated. At most, repair work would include the replacement of water mains, water lines, valves, manholes and fire hydrants. Water service may be temporarily disrupted during periods of work; however, this impact is considered short-term and temporary.

MITIGATION. No mitigation is required.

5.12.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, soldiers living off-post would impact the water systems in their areas. The resulting impacts are expected to be negligible because the total number of displaced soldiers represents less than one percent of the total inhabitants of the surrounding communities of Mililani and Wahiawa.

MITIGATION. No mitigation is required.

5.12.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, soldiers living off-post would impact the water systems in their areas. The resulting impacts are expected to be negligible because the total number of displaced soldiers represents less than one percent of the total inhabitants of the surrounding communities of Mililani and Wahiawa.

MITIGATION. No mitigation is required.

5.13 Wastewater Facilities

The measure of significant impacts to wastewater facilities is discussed in the *Final Programmatic EA* (pg. 5-43). Project actions are determined to have a significant adverse environmental impact if wastewater generated by the project exceeds the capacity of wastewater treatment facilities operated by the Army or City and County of Honolulu. Adverse but insignificant impacts are associated with major expansion of existing distribution lines and facilities or existing collection lines. Adverse, short-term, insignificant impacts are associated with the relocation of existing collection lines during proposed work. Negligible impacts are associated with project actions requiring only line extensions that tie into existing collection lines without requiring line improvements.

5.13.1 The Proposed Action: Repair and Renovate Existing Assets. The Proposed Action includes the modernization of existing facilities for soldiers on Schofield Barracks Military Reservation. Dining facilities would generate industrial wastewater from food service activities, such as grease. Pre-treatment devices such as grease traps would be installed in accordance with standard treatment practices. Sinks, toilets and other fixtures would utilize modern flow-restricted designs that would result in no increase in wastewater flows over existing conditions. The existing Schofield wastewater treatment plant (WWTP) is expected to accommodate the wastewater generated by project actions. Concerns pertaining to the adequacy of the collection system in the project area are expected to be addressed comprehensively in the Schofield Barracks Real Property Master Plan.

MITIGATION: No mitigation is required.

5.13.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, on-post living quarters would not be modernized since soldiers would instead occupy off-post housing units. The resulting impacts to the wastewater collection system in the surrounding community are expected to be negligible because the total number of soldiers displaced by this alternative represents less than one percent of the total inhabitants of Mililani and Wahiawa.

MITIGATION: No mitigation is required.

5.13.3 Alternative 2: Purchase Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, on-post living quarters

would not be modernized since soldiers would instead occupy off-post housing units. The resulting impacts to the wastewater collection system in the surrounding community are expected to be negligible because the total number of soldiers displaced by this alternative represents less than one percent of the total inhabitants of Mililani and Wahiawa.

MITIGATION: No mitigation is required.

5.14 Solid Waste System

Significance criteria pertaining to solid waste collection and disposal are discussed in the *Final Programmatic EA* (pgs. 5-48 to 5-49). Project actions are determined to have a significant impact if the operational contribution to the waste stream exceeds the capacity of the City and County of Honolulu landfill or other waste disposal method. Otherwise, the effects to the solid waste system are considered to be negligible. A potentially significant impact would also occur if the project did not support State of Hawaii waste reduction goals (Chapter 342-G) expressed in the State Integrated Solid Waste Management Plan (State of Hawaii, 1991).

5.14.1 The Proposed Action: Renovation. The Proposed Action would generate solid waste including debris, waste construction materials, etc. that may be transported to either a municipal landfill or to the H-Power facility for disposal. The Army currently employs waste reduction and recycling policies. The Army is currently developing a recycling program that will strive to meet the recycling policy of the City and County of Honolulu. Waste is currently reduced and/or recycled prior to disposal to the municipal landfill. The capacity of the landfill or other solid waste disposal methods is not expected to be exceeded; therefore no significant impacts are anticipated. The operation of the Quads is expected to result in no increase in solid waste volumes.

MITIGATION: No mitigation is required.

5.14.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, a smaller quantity or volume of solid waste would be generated since on-post housing assets would not be repaired or renovated. The resulting impacts to the solid waste collection system from the soldiers who occupy off-post housing units are expected to be negligible because the total number of soldiers displaced by this alternative represents less than one percent of the total inhabitants of Mililani and Wahiawa.

MITIGATION: No mitigation is required.

5.14.3 Alternative 2: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, a smaller quantity or volume of solid waste would be generated since on-post housing assets would not be repaired or renovated. The resulting impacts to the solid waste collection system from the soldiers who occupy off-post housing units are expected to be negligible because the total number

of soldiers displaced by this alternative represents less than one percent of the total inhabitants of Mililani and Wahiawa.

MITIGATION: No mitigation is required.

5.15 Power and Communications

Significance criteria pertaining to power and communications are discussed in the *Final Programmatic EA* (pg. 5-50). Project actions would not be significant unless the utility is unable to accommodate the projected consumption demand. Service disruptions during the work period or the installation of additional power or communication lines are considered to be short-term, adverse but insignificant impacts.

5.15.1 The Proposed Action: Repair and Renovate Existing Assets. The Proposed Action would generate no major increases in power consumption. The Army would employ energy conservation measures through the use of energy-efficient equipment and systems. Power would continue to be purchased from the Hawaiian Electric Company and communications service would continue to be provided from GTE Hawaiian Tel (now Verizon Hawaii, Inc.). Power and communication systems within Schofield Barracks Military Reservation would consist of an Army-owned and Army-maintained distribution system. Modernization may include improvements to transformers and the installation of electrical line, lighting and manholes. Electrical systems within the buildings of Quads B, C, D, E and F may also be upgraded. Similarly, the telephone cable system at Schofield Barracks Military Reservation may be upgraded to support personal service in individual rooms. Modernization may include improvements to cables, ducts, manholes, etc. The impacts of proposed repair and renovation work may disrupt power and communication systems but these effects are expected to be short-term and temporary.

MITIGATION: No mitigation is required.

5.15.2 Alternative 1: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action because the soldiers who occupy off-post housing assets would still generate a demand for power and communications services; however, the Army will have limited control over the use of energy conservation measures in off-post housing assets. The impacts of proposed repair and renovation work may disrupt power and communication systems but these effects are expected to be short-term and temporary.

MITIGATION: No mitigation is required.

5.15.3 Alternative 2: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action because the soldiers who occupy off-post housing assets would still generate a demand for power and communications services; however, the Army will have limited control over the use of energy conservation

measures in off-post housing assets. The impacts of proposed repair and renovation work may disrupt power and communication systems but these effects are expected to be short-term and temporary.

MITIGATION: No mitigation is required.

5.16 Public Services (Police, Fire, Health, Outdoor Recreation)

Significance criteria pertaining to public services are discussed in the *Final Programmatic EA* (pg. 5-53). Project actions are determined to have a significant impact to law enforcement and fire protection services if the increase in the demand for these services results in the inability of police and fire units to respond to emergencies within their operational standards. Typical standards for law enforcement are a five-minute response time for life threatening calls. With respect to fire protection, the standard is adequate fire hydrant flow. Significant impacts to health care service or outdoor recreation facilities would be an increased demand beyond the capacity of services or facilities to adequately respond to the demand.

5.16.1 The Proposed Action: Repair and Renovate Existing Assets. The Proposed Action would generate no major increases in the demand for police or fire protection services because the Quads would serve the same population of soldiers within existing structures. For these reasons, no increase in the demand for health care services or outdoor recreation facilities is anticipated.

MITIGATION: No mitigation is required.

5.16.2 Alternative 2: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, the soldiers who occupy off-post housing assets may generate a negligible demand for police and fire protection from the stations that serve the communities of Mililani and Wahiawa. The soldiers who occupy off-post housing are expected to continue to utilize the health care services and outdoor recreation facilities at Schofield Barracks Military Reservation.

MITIGATION: No mitigation is required.

5.14.3 Alternative 3: Lease Off-Post Assets and Renovation. Anticipated impacts would be the same as for the Proposed Action; however, the soldiers who occupy off-post housing assets may generate a negligible demand for police and fire protection from the stations that serve the communities of Mililani and Wahiawa. The soldiers who occupy off-post housing are expected to continue to utilize the health care services and outdoor recreation facilities at Schofield Barracks Military Reservation.

MITIGATION: No mitigation is required.

SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 6.0 FINDINGS AND DETERMINATIONS

This Supplemental EA concludes that the Proposed Action to repair, renovate and/or modernize Quads B, C, D, E and F as described for the Proposed Action, Alternative 1 and Alternative 2 does not constitute a major federal action having significant effects on the quality of the human environment. Furthermore, an Environmental Impact Statement (EIS) is not required as defined by the Council of Environmental Quality regulations (40 CFR 1500-1508) and Army Regulation 200-2.

Based on the analysis of environmental consequences of the Proposed Action and alternatives, the U.S. Army will implement the Proposed Action based on the following reasons:

- Unit integrity will be maintained and military readiness will not be sacrificed. Alternatives 1 and 2 will result in soldiers being moved off-post and scattered throughout the surrounding community, thereby resulting in slower response times during emergencies and greater coordination/communication needs.
- Repair, renovation and/or modernization of living and working quarters is anticipated to be less costly in the long-term than either leasing or purchasing off-post assets.

It is recommended that a Finding of No Significant Impact (FNSI) be prepared and a notice of availability of the EA and FNSI be given to the public by making them available in the State of Hawaii Department of Health, Office of Environmental Quality Control (OEQC) Bulletin.

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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 8.0 LIST OF PREPARERS

<u>PREPARER</u>	<u>RESPONSIBILITIES</u>	<u>AFFILIATION</u>	<u>EXPERIENCE</u>
Claire Tom, Planner	Document Writer & Production Manager	Wil Chee - Planning, Inc.	9 years
Ivan Tilgenkamp, Senior Planner	Assistant Production Manager	Wil Chee - Planning, Inc.	34 years
Wil Chee, President	Production	Wil Chee - Planning, Inc.	27 years

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SUPPLEMENTAL EA FOR THE RENOVATION OF QUADS B, C, D, E AND F
SECTION 9.0 LIST OF INDIVIDUALS AND AGENCIES CONSULTED

Individuals

Lindsey, David, U.S. Army Corps of Engineers, Honolulu District
Lucking, Laurie, U.S. Army Garrison, Hawaii, Directorate of Public Works
Miura, Beth, U.S. Army Corps of Engineers, Honolulu District
Shun, Kanalei, U.S. Army Corps of Engineers, Honolulu District
Yuh, Peter, U.S. Army Garrison, Hawaii, Directorate of Public Works

United States Federal Agencies

U.S. Army Garrison, Hawaii, Directorate of Public Works
U.S. Fish and Wildlife Service

State of Hawaii Agencies

Office of Environmental Quality Control
State Historic Preservation Office

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Appendix A
Consultation Letters & Responses



DEPARTMENT OF THE ARMY
HEADQUARTERS, UNITED STATES ARMY GARRISON, HAWAII
SCHOFIELD BARRACKS, HAWAII 96857-5000

RESERVE ATTENTION OF

8 OCT 2000

Directorate of Public Works

Mr. Timothy Jobas
Chairperson and State Historic Preservation Officer
Department of Land and Natural Resources
555 Kahaikaha Bldg
601 Kamohila Blvd
Kapolei, Hawaii 96707

Dear Mr. Jobas:

The U.S. Army Garrison, Hawaii wishes to initiate Section 106 coordination and consultation with your office pursuant to the National Historic Preservation Act of 1966, as amended (NHPA), with regards to the Garrison's proposed plans to renovate Quads B, C, D, E, and F on Schofield Barracks, Oahu. The Garrison is proposing to upgrade the interior of the Quads to the standards set for the Army's Whole Barracks Renewal Program; exterior modifications are also being considered. The five Quads have been evaluated as historic properties, comprising the central portion of the Schofield Barracks Historic District (see Enclosure), and the proposed renovations will have an adverse effect.

To counter the adverse effect, the Garrison is proposing a minimum of three actions: 1. Conduct architectural surveys to identify features, interior as well as exterior, of the buildings that contribute to the significance of the Quad; 2. Conduct a condition assessment of each building of the Quads to determine the level of seismic retrofitting that will be necessary for each building; and 3. Hire an architect with considerable historic preservation experience as the Architect of Record for the project, involved in the design and construction of each renovation. We propose that a Programmatic Agreement (PA) be prepared in consultation with your office, the Historic Hawaii Foundation, and the Advisory Council on Historic Preservation detailing actions and stipulations that shall be taken by the Garrison to ensure the protection and preservation of the significant features in the structures over the entire renovation period.

The construction renovation of the Quads is being phased out over the years to begin with Quad F in fiscal year (FY) 2001, Quad C in FY 2003, Quad E in FY 2004, Quad D in FY 2005, and Quad B in FY 2006. HED anticipates that, with the completion of a signed PA as stated above, the proposed renovation of Quads B, C, D, E, and F shall allow for a "no adverse effect on historic properties" finding. Your concurrence to this finding is being requested pursuant to Section 106 of the NHPA and its implementing guidelines.

If you should have any questions, please contact the Dr. Laurie Lurking, Cultural Resources Manager, Directorate of Public Works, at (808) 656-2878 ext. 1052 or facsimile number (808) 656-1039.

Sincerely,

ORIGINAL SIGNED BY:
William E. Ryan III
Colonel, U.S. Army
Director of Public Works

Enclosure



WILLIAM E. RYAN III
GOVERNOR OF HAWAII

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kahaloa Building, Room 825
401 Kalia Boulevard
Honolulu, Hawaii 96807

January 6, 2001

William E. Ryan, III
Colonel, U.S. Army
Director of Public Works
Department of the Army
Headquarters, United States Army Garrison, Hawaii
Schofield Barracks, Hawaii 96857-5000

Dear Colonel Ryan:

SUBJECT: Federal Regulations, Section 106 (NHPA)
Renovation of Quads B, C, D, E and F
Schofield Barracks
TMK 7-7, Waialua, Oahu

LOG NO: 26783
DOC NO: 01010002
Architecture

Thank you for letter dated October 25, 2000, received January 3, 2001, regarding the proposed renovation of the Quads B, C, D, E and F. We concur that the quads are significant historic properties and are a part of the Schofield Barracks Historic District. We also concur that the proposed renovations will have an adverse effect on the properties. We concur that a Programmatic Agreement (PA) should be developed and look forward to working with the Army and other consulting parties. We believe that the mitigation can be developed in the PA to provide a finding of "no adverse effect."

Thank you for the opportunity to comment. Should you or your staff have any questions please contact Carol Ogata at 692-8032.

Aloha,

TIMOTHY E. JOHNS
State Historic Preservation Officer

CO-34

JAN 10 2001

WISNET COLUMBIANAVAL CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
Coordinator for Public Works Management

DEPT. OF LAND AND NATURAL RESOURCES
JANET L. JAWELD
LAND, HONOLULU

AVIATION RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES
SPONSORSHIP
CONSERVATION
CULTURAL AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

Questions and Answers for DACA83-01-R-0017

Dick Pacific Construction, Jun 1:

Q1. RFP Reference Paragraph/Page: S-2/00100-11

Subject Matter: Asbestos Abatement

Please define the extent of asbestos abatement indicated in the paragraph below.

S-2 ASBESTOS ABATEMENT (AUG 1996)

Asbestos abatement is part of the scope of work for the proposed contract. Refer to paragraphs entitled, "ASBESTOS---(OCCUPATIONAL HEALTH AND ENVIRONMENTAL)" in Section 00800 and applicable sections of the technical specifications and drawings.

Will the ongoing contract completely remove all of the asbestos in the building?

A1. The ongoing contract will not make the buildings asbestos free, but rather, the intent is to remove all friable asbestos that would affect performance of the design-build contract.

Asbestos containing material such as plaster on walls and ACT flooring are not being removed.

If any work under this RFP causes the disturbance of items such as asbestos-containing plaster or flooring, appropriate abatement procedures must be used.

Q2. RFP Reference Paragraph/Page: Spec. Section 01011 paragraph

1.1.1, 2.2.2, 3.2.2, 4.2.2, and 5.1.2.

Subject Matter: Limitations of the budget

We would like to get some information on the budget for the various components of the project.

In the paragraphs for the design requirements for the UEPH, Brigade Headquarters, Battalion Headquarters, Company operations facility, and Dining facility one of the five distinctive concerns for design was "economics (the limitations of the budget)".

We would like to get further information on what the limits to the budgets are so that we can design to them.

A2. The approximate total budget for this RFP is \$30,000,000 for MCA work and \$18,000,000 for BUP work.

Q3. RFP Reference Paragraph/Page: Spec. Section 01011 page 1-1

Subject Matter: Mix of 2 person and shared bathrooms.

Is there a minimum or maximum amount of two person or private bathrooms described in paragraph 01011.1.2.

A3. NO, THERE ARE NO MINIMUM OR MAXIMUM NUMBER OR AREA REQUIREMENTS FOR BATHROOMS.

Q4. RFP Reference Paragraph/Page: 01010.1.2.6.1.2 page 1-3

Subject Matter: Have the results of the Anti Terrorist/Force protection study been published yet? We would like to get a copy as soon as possible to determine the scope of work for the AT/FP.

A4. The AT/FP study is being provided with this amendment.

Dick Pacific Construction, Jun 4:

Q5. RFP Reference Paragraph/Page: 01011.3.3.1 (page 3-2)

Subject Matter: ADA Compliance for Battalion Headquarters classrooms at the Third Floor of Building 650.

3.3.1 Battalion Headquarters will be designed for physically handicapped individuals. This facility will be located on the third floor of Building 652. This project requires compliance with the current version of ADAAG (ADA Accessibility Guidelines) only as issued by the Access Board under 36 CFR Part 1191 and excludes the full ADA implementing rules issued by the Department of Transportation and Department of Justice.

a. The paragraph quoted above refers to the battalion headquarters located in Building 652. Please verify that the headquarters is located in building 649 per table 1-1 in paragraph 01010.

b. There are several Battalion Headquarters Classrooms located on the third floor of Building 650. Do these classrooms need to comply with the ADA requirements?

A5. YES, CLASSROOMS NEED TO COMPLY WITH ADA REQUIREMENTS.

SECT 01011 PARA 3.2.3.3 (pg 3-1) states: "Handicapped accessibility will be provided for the classrooms."

Dick Pacific Construction, Jun 6:

Q6. RFP Reference Paragraph/Page: 01010 paragraph 1.3.2 and 3.3.1

Conflict in specs regarding the ceilings in the living units. One calls for plaster ceilings or texture on concrete whereas other talks about gypsum drywall. Please clarify which is required.

1.3.2 Ceilings. Textured ceilings on exposed concrete or plaster ceilings will be provided in the sleeping/living rooms. Suspended acoustical tile ceilings will not be provided in the sleeping/living rooms.

Interior Finishes.

3.3.1 Walls and ceilings. Provide 13 mm (1/2-inches) gypsum wallboard, taped and slightly textured finished. Water-resistant wallboard shall be used in wet areas such as bathroom and laundry rooms, and cementitious backer board shall be used for ceramic tile applications. 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 to maintain and service equipment above the ceiling.

A6. Plaster ceilings are not required in the living units. Section 01011 Para 1.3.2. Ceilings will be revised.

Q7. RFP Reference Paragraph/Page: Drawing R-2

The drawings indicate "service areas" in Bldg 650 where the existing toilets protrude at right angles to the building. Do these remain as toilets.

A7. No, these do not remain as toilets. We are providing bathrooms shared by no more than 2 soldiers in their living/sleeping modules. These areas should contain everything except the soldiers living/sleeping modules.

Q8. RFP Reference Paragraph/Page: 01010.3.2.3

Please verify if thermal insulation is required on the existing concrete walls.

A8. Follow the RFP. Designer is responsible to comply with energy expenditure requirements of TI 800-01. If designer decides to provide insulation to lower energy expenditure, then the insulation must meet the requirements of Section 1010-3.2.3. No changes are required to the RFP as a result of this question.

Q9. RFP Reference Paragraph/Page: 01010.12.3.1 and paragraph 2.7.7

Part of the RFP narrative requirements is to indicate if the existing water distribution system ins (sic) adequate. Paragraph 2.7.7 indicated that the pressure will need to be verified after the

award. Is there any available data now to indicate if the pressure at the existing quad F is adequate? We would like to determine if a fire pump is required for the sprinkler system.

12.3.1 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.

2.7.7 Hydrant Flow Test Data. The following flow test data are provided for offeror's use to evaluate available water supply and design water systems: (Note that after award of D-B contract, the contractor is responsible for verify the pressure and flow capacity of the system. Any subsequent hydrant flow tests shall be conducted with the Schofield clear well pumps off. POC for Schofield Barracks, Water Plant is Wade Nakai, 655-2510.)

A9. The hydrant data provided should be used by each proposer to evaluate available flow and pressure. The fire sprinkler designer should use this data to do preliminary calculations and determine if the existing water distribution system is adequate to supply fire protection or if a fire booster pump is required. Proposers should also refer to paragraph 9. Fire Protection, for design/construction requirements.

Q10. RFP Reference Paragraph/Page 01010.2.4.2.2

Please provide additional information on the Gear Wash facility prior to the bid, to allow so that we can determine what the budget for the facility will be. Minor coordination can be done after the award but we will need more information to determine the major costs for the facility.

1.2.5.1 Covered Gear Wash/Recreational Area. A new covered gear wash and recreation facility shall be constructed within the quadrangle courtyard. The primary function of the facility is to provide an area for washing and cleaning soldier personal gear (TA-50). This facility will also co-function as an outdoor recreational area for social gatherings. The recreational area shall include built-in barbecue pits, sink, and tables to accommodate one (1) Company sized gathering. A Company Operation Facility standard design is included in this solicitation as a reference to adapt. Designs will be based on the gear wash functional area requirements of the design standard.

2.4.2.2 Size. The approximate size of the facility indicated on the RFP drawing is intended for budgeting purposes only. Designer shall coordinate with the government after award to determine the overall facility size.

7.1 Covered Gear Wash/Recreational Area.

The standard design package for Large Company Operations Facilities (COF), which includes functional area requirements for a gear wash area should be used to develop the gear wash area requirements. This facility will also be designed for joint usage as a covered recreational area for social gatherings. The recreational area shall be sized to include picnic table seating for 50 to 60 people, 2 built-in barbecue pits, 1-sink, lighting and electrical outlets.

A10. Additional information is found in paragraph "1.2.5.1. Covered Gear Wash/Recreational Area. A new covered gear wash and recreation facility shall be constructed within the quadrangle courtyard. The primary function of the facility is to provide an area for washing and cleaning soldier personal gear (TA-50). This facility will also co-function as an outdoor recreational area for social gatherings. The recreational area shall include built-in barbecue pits, sink, and tables to accommodate one (1) Company sized gathering. A Company Operations Facility standard design is included in this solicitation as a reference to adapt. Designs will be based on the gear wash functional area requirements of the design standard."

This paragraph will be amended to include at the end of the above paragraph: In addition to the exterior covered gear wash/recreational area, provide a gear wash area on the ground floors of Buildings 651 and 652. The gear wash area is to be used by the soldiers after field training to

clean their gear and foot wear before returning to their rooms. Provide well illuminated and ventilated gear wash areas with multiple hose bibs, drains with sedimentation catch basins, and drying racks."

Dick Pacific Construction, Jun 7:

Q11. RFP Reference Paragraph/Page: 00120.4.1.1.1 (page 00120-9)

4.4.1.1.1 Submission Requirements for Evaluation Subfactor 4.1.1

-Identify the key managerial and technical home office and on-site personnel who will be assigned to work under the contract.

-For each person so identified, provide a resume or other information that describes his or her qualifications for the job(s) that the person will be performing, including any special skills or experiences deemed worthy of note.

-Describe each person's familiarity with U. S. Government design and construction procedures, including Contractor Quality Control (CQC) procedures, if applicable to the position the person is to hold within the design build team organization.

-For all named, proposed subconsultants/subcontractors, provide the same information as required in the preceding paragraphs for the subconsultants/subcontractors' proposed key managerial and technical home office and on-site personnel. Regardless of the percentage of the work they may undertake, this evaluation factor applies to the entire design build team assembled to execute this project.

In the paragraph referenced above, please clarify the following information:

- a. Please clarify if "subconsultants/subcontractors" refers to only the design team or if it also refers to the (trade) subcontractors as well.
- b. Is the SF 254 or SF 255 the desired format for the consultants to provide this information? It is an industry standard and provides a lot of additional information that may be desirable (see question below).
- c. If information on the subcontractors were also desired, providing information for all subcontractors "regardless of the percentage of work" would be impractical. Can specific trades be identified to address rather than "all subcontractors"?

A11.a. This refers to all subcontractors, design as well as trade.

b. The SF 254 or SF 255 are not the desired format for the consultants. Evaluation Subfactor 4.1.1 shall be addressed in accordance with the submission requirements identified in paragraph 4.4.1.1.1.

c. The requirement remains applicable to all subcontractors, as stated. This is necessary to allow complete evaluation of all proposals.

Q12. RFP Reference Paragraph/Page: 00120.4.1 & 4.2 (page 00120-6)

Is any information on the subconsultants/subcontractors (as defined above) required for Factor 1 (Past Performance) or Factor 2 (Experience)?

A12. If the offeror proposes to subcontract part of the work, information is required for the proposed subcontractors for Evaluation Factors 1 and 2. See Section 00120, Attachment 2, paragraph 7 and Attachment 3, paragraph 6.

Caddell Construction Co., Inc., Jun 8:

Q13. To expect to receive good proposals in the amount of time allotted is unreasonable. A 2 to 3 week extension is justified on this project.

A13. The hour and date specified for receipt of offers is extended. Offers are due July 31, 2001, 2:00 p.m. (Hawaii Standard Time).

Ocean House Builders, June 8:

Q14 and Q15 pertain to Section 01010 - General Project Description and General Design Requirements, Subsection 4, General Design-Structural

Q14. Page 4-4: Para 4.14 Antiterrorism/Force Protection notes that the Government is preparing an AT/FP assessment and retrofit report that was expected to be completed on or about the end of May 2001. The retrofit upgrades recommended in the report are to be included in the design proposal and project costs. Please verify if the Government has issued this report as it is critical to the design and construction cost of the project.

A14. The AT/FP study is being provided with this amendment.

Q15 Page 4-4 to 4-5: Para 4.15 Seismic Evaluation and Rehabilitation notes that the Government is preparing an independent seismic evaluation and rehabilitation report as an Amendment to the RFP that was expected to be completed on or about the end of May 2001. The rehabilitation techniques and retrofit upgrades recommended in the report are to be included in the design proposal and project costs. Please verify if the Government has issued this report as it is critical to the design and construction cost of the project.

A15. The AT/FP and seismic study is being provided with this amendment.

Ocean House Builders, Jun 12:

Q16. Has the Section 106 process for Solicitation No. DACA83-01-R-0017 been taken care of by the U.S. Army Corps of Engineers? If so, please advise how an offeror may receive a copy of it.

A16. Section 106 (including architectural and historical) requirements are as indicated in the RFP.

Q17. Page 00120-9 & 00120-10: Subfactor 4.1, Key Personnel Experience, & Subfactor 4.2, Quality Control Plan: No reference is made to address the qualifications of the QC organization stated in Section 01451, paragraph 3.4.1 to 3.4.4. Should these qualifications be addressed in the preparation of the technical proposal?

A17. See Subfactor 4.2.2, Offeror's QC team structure, task assignments, and areas of responsibility.

Q18. Is an offeror able to use a design consultant, who is part of his design team, as part of his CQC organization (i.e. air monitoring) for this project? The reason being if this is a conflict of interest.

A18. Yes, an offeror may use a design consultant, who is part of the design team, as part of their CQC organization.

Dick Pacific Construction, Jun 12:

Q19. RFP Reference Paragraph/Page: 01010.8.11 (page 8-3)

Please indicate if fire sprinklers are required in the exterior corridors and arcades in the building.

A19. Sprinkler protection is supposed to be provided in accordance with NFPA 13. Since we do not know what the design looks like, we would like to refer this question to your sprinkler

contractor. All contractors are responsible for the design and we are not in a position to specifically require sprinkler anywhere without specific information on the design. The RFP requires all buildings to be sprinklered.

Q20. RFP Reference Paragraph/Page: 01010.1.3.2.3

Will cashier stations be required in the dining facility, or will there only be a check in desk?

A20. A cashier station is required in the dining facility in conformance with the ala carte dining service. Ala carte dining service is defined as soldiers go through the serving lines and pay for only what is on their food tray. In addition to the cashier station, a check-in station at the start of the line is also required. The check-in station requirement will be an electrical outlet and a data/telephone outlet. This station is required during special events like Thanksgiving when everyone checks in at the start of the serving line.

Ocean House Builders, Jun 12:

Q21. Drawing No. 33, Sheet E-3, titled "Partial Roof Electrical Plan - Removal & New", is missing from the CD provided for the above solicitation. Instead, Drawing No. 34, Sheet E-4, titled "Quad F 'MCC' Single Line Diagram - Removal & New," is provided twice. Will Sheet E-3 be provided?

A21. Yes, Sheet E-3 is provided.

Q22. Is it safe to assume that "Quality Control Engineer" is the same as "CQC System Manager"? Page 00120-9, Paragraph 4.4.1, Subfactor 4., states "Quality Control Engineer" while Page 01451-4, Paragraph 3.4.2 states "CQC System Manager." Please clarify.

A22. Yes, for the purposes of this RFP, that can be assumed.

Q23. Page 00120-9, Paragraph 4.4.1, Subfactor 4.1 does not provide any requirements or qualifications for the listed key personnel. Is there no minimum requirements other than those listed for the CQC organization in Section 01451, Paragraph 3.4?

A23. There are no submission requirements for Subfactor 4.1, however, see the submission requirements for Subfactors 4.1.1 and 4.1.2.

Dick Pacific Construction, Jun 12:

Q24. RFP Reference Paragraph/Page: 00130.2.3.1.2 (page 00120-4)

Please verify that the technical information and catalog cuts will be submitted in a separate 3 ring binder in addition to the 4 volumes with factors 1 to 5.

Is it necessary to have this technical folder separated by civil and by building since most of the technical information will be the same for each building?

A24. Section 00120, paragraph 2.3.1.2 is revised in AM-0002.

Ocean House Builders, Jun 14:

Q25. The CAD files would be needed so that we can draw our concept plans utilizing the building outlines on the drawings. If they are not available, we'd have to scale off of the pdf drawings and they will not be accurate. Accessing the standard designs provide the program areas for the various individual rooms for the ueph's, brigade, battalion and company headquarters, and the dining facility. It is the program areas that are required for the design of

the layouts. The narratives under the descriptions for those functions in the CD's do not provide these program areas.

A25. All available CADD files will be provided by amendment. CADD files may be limited to buildings.

Ocean House Builders, Jun 14:

Q25. The CAD files would be needed so that we can draw our concept plans utilizing the building outlines on the drawings. If they are not available, we'd have to scale off of the pdf drawings and they will not be accurate. Accessing the standard designs provide the program areas for the various individual rooms for the ueph's, brigade, battalion and company headquarters, and the dining facility. It is the program areas that are required for the design of the layouts. The narratives under the descriptions for those functions in the CD's do not provide these program areas.

A25. The CAD files are provided with this amendment.

Nordic Construction, Ltd., Jun 15:

Q26. We are considering bidding the referenced design/build project. However, the bid period is restrictive for a design/build project of this magnitude. Therefore, we are requesting a postponement of the bid for a minimum of an additional thirty (30) days from the scheduled bid date.

A26. AM-0002 extends the hour and date specified for receipt of offers to July 31, 2001, 2:00 p.m. (Hawaii Standard Time).

Dick Pacific Construction, Jun 16:

Q27. RFP Reference Paragraph/Page: 01010.5.2.1.1

The paragraph on air conditioning indicates that "All piping designated on this sheet as existing, that is common to the support of both Quad E and Quad F shall be replaced in kind with new, including the condenser water piping."

A check of the existing chiller and discussions with facilities personnel indicate that this piping in the mechanical room is very new. Is it the intent to replace all of the piping to the chiller regardless of condition?

A27. The RFP requires replacement of only piping identified as "existing" on the HECO drawings. All piping NOT identified as "existing" on the HECO drawings shall NOT be replaced.

Q28. RFP Reference Paragraph/Page: General

The "as built" drawings provide do not indicate which interior walls are metal stud and which are cmu. Given the short duration of the bid period, and the number of bidders, can the government provide an indication of which interior walls are cmu?

A28. The Government does not have that information.

Ocean House Builders, Jun 19:

Q29. Page 00120-12, Paragraph 4.5.3, Subfactor 5.3 asks for the "extent of participation of Eligible Small Disadvantaged Business concerns, in the performance of the contract." Please explain what is meant by "Eligible Small Disadvantaged Business concerns." The note below the subfactor explains "Eligible Small Disadvantaged Business concerns" to be Small Disadvantaged Business concerns within industries identified in the Standard Industrial

Classification (SIC), Major Groups, as determined by the Department of Commerce, in 64 FR 52806, September 30, 1999.” Information on “64 FR 52806” was located, but were only the attached copies of a PDF file. Unfortunately, this file did not help to provide any explanation. Are we misunderstanding something? Is there a list identifying what businesses qualify as Eligible Small Disadvantaged Business concerns? If so, how can we obtain such a list?

A29. The table in 64 FR 52806 provides recommendations specific to major industry groups (and combinations thereof) which apply nation-wide for all industry groupings except the major construction industry groups (SIC Major Industry Groups 15, 16, and 17). Determinations in these three major groups apply regionally rather than nationally. Regional definitions are based on the nine multi-state Divisions. For example, under SIC 15, a small disadvantaged business (SDB) concern located in the East North Central region which includes Illinois, Indiana, Michigan, Ohio, and Wisconsin would be an eligible SDB concern. Conversely, a SDB in the Pacific region which includes Alaska, California, Guam, Hawaii, Oregon, and Washington would not be an eligible SDB concern.

Dick Pacific Construction, Jun 20:

Q30. RFP Reference Paragraph/Page: 01010.2.4.4.1

Sheet C-1 does not indicate where the 2 bicycle racks are to be located. Please provide a sketch.

A30. 2.4.4.1 Location and Orientation. The approximate location of the bicycle racks are indicated on the attached RFP drawing entitled, SITE REDEVELOPMENT REQUIREMENTS-1, Sheet C-1. The designer shall coordinate with the government to determine exact location and orientation preferred after award.

Q31. RFP Reference Paragraph/Page: 01010.4.13

There is a reference to the Arms Vault requirements in appendix G. The specifications only go to appendix F. Please provide.

4.13. Arms Vaults. The arms vault in each Company Operations Facility shall meet the requirements of AR 190-11, Change 1, Appendix G, para G-2.

A31. Appendix G can be found at website <http://www.usapa.army.mil/gils/epubs4.html>.

Q32. RFP Reference Section 00120, Attachment Nos. 2 & 3

There is a reference at the end of each attachment to provide similar information on Past Performance and Design Build Experience for Offeror’s proposed subcontractors. Is this intended for the design consultant team? Does it apply to all the firms that will be employed as subcontractors? In design build, it is more difficult for a Contractor to decide on his subcontractors when the design is not complete. If the intent is to provide information on subcontractors, can this be narrowed down to “key” or “major” subcontractors like mechanical, electrical, demolition and drywall?

A32. The intent is to obtain information on all subcontractors and subconsultants, if possible. You should provide information on all of these subs as available.

A-1 A-Lectrician Inc., Jun 20:

Q33. 7.2.1.2 (Telecommunications Premises Distribution Systems): Paragraph states all cabling shall be plenum rated. Does this infer that cable trays may be installed in lieu of 1” conduit, where accessible and cabling method complies with ANSI/EIA standards? (1” conduit will be provided in wall spaces and inaccessible ceiling locations.)

A33. The intent of an RFP is to have the contractor propose alternative construction methods by providing flexibility and innovation in design. Plenum cable or non-plenum cable to be used depending upon the design. In either case, the copper cables must conform to ANSI/ICEA S-80-576 for horizontal cabling except where fiber optic cables are used or required.

Q34. 7.4.5 (Ducts): Paragraph states “ A minimum of one spare duct shall be provided for each ductline.” Is the design intended to furnish an empty, spare duct for each individual duct installed or to furnish a spare duct for each group of ducts comprising a ductline? (i.e. provide (1) - 4” duct spare for a parallel feeder ductline with (4) - 4” ducts.)

A34. The intent of the RFP is to have the proposer provide a minimum of one spare duct be provided for each group of ducts comprising a ductline. Please note that TM 5-811-1 Electrical Power Supply and Distribution, Chapter 7, para 7-3 requires that a sufficient number of spare ducts will be provided in duct systems between manholes to provide for at least a 25 percent increase in the number of cables. Also note that spare ducts shall be plugged to prevent the entry of debris and rodents.

Dick Pacific Construction, June 22:

Q35. RFP Reference Paragraph/Page: Attachment 23 (labeled as Attachment 15 Miscellaneous provision)

(2) Disposal of Solid Wastes.

Dwelling units to be demolished under this contract may contain asbestos materials and lead based paint on substrate....

LCP on substrate will be disposed thereof accordingly.

Given the short time period, is there a report that quantifies the amount of peeling lead paint, particularly in the covered ceiling areas?

A35. There is no report that provides this information.

Q36. RFP Reference Paragraph/Page: Proposal form 00010.

Please define the difference between item 1 (FY01 MCA PN 52265 NEW CONSTRUCTION, QUAD F, and item 2 (FY01 BUP PN 52266 - RENOVATE, QUAD F).

Is the new construction limited to the new gear wash facility, with everything else as “renovation?” Is the re-alignment of Foote Ave. considered new or renovation construction?

A36. The items of work identified as either MCA or BUP are shown on drawing sheet nos. R5, R6, R7 & R8.

Questions Answered Telephonically

Q37. For what number of enlisted personnel should the Quad be designed?

A37. The quad should house a minimum of 300 enlisted soldiers.

At the least: 150 soldiers for Building 649 and 150 soldiers for Building 650.

Q38. How many enlisted personnel to a room?

A38. The basic UEPH module consist of 2 living/sleeping rooms that share a common bath.

There will be only one room assignment per living/sleeping room. The contractor has the option under the "new UEPH standards" to provide single rooms or studio apartments that will house only one soldier with a private bath. In either case, there will be only one soldier in a room.

Dick Pacific Construction, Jun 27:

Q39. RFP Reference Paragraph/Page: Plans Sheet R-6 (ring no. 16)

The second floor of building 650 allocates a space for the 8th Field Surgical Team. This COF is not mentioned in any of the other rfp requirements. Please indicate if this Company Operations Facility is needed and if it can be located in an area other than the second floor of Building 650.

A39. Yes, the 8th Field Surgical Team COF is needed.

No, the 8th Field Surgical Team COF can not be located in another area. It must be located on the second floor of Bldg 650.

ATTACHMENT 27

REFERENCES

ATTACHMENT 27

REFERENCES.

1. Technical Criteria. Criteria to be used for design and construction shall be taken from the most current references at the date of issue of the RFP. The wherewithal to obtaining these criteria is shown below. Administrative, contractual, and procedural features of the contract shall be as described in other sections of the RFP. Codes and standards specifically referred to elsewhere in this RFP shall be the minimum acceptable criteria.

1.1. Federal/Specifications, and Standards. Federal Standard, Uniform Federal Accessibility Standards, and federal specifications are available from Commanding Officer, Naval Publications and Forms Center, ATTENTION: NPODS, 5801 Tabor Avenue, Philadelphia, PA 19120- 5099.

1.2. Other Government Documents and Publications. The following Government documents and publications form a part of this document to the extent specified elsewhere in this RFP.

1.2.1. NBS Handbook 135, Life-Cycle Costing Manual for the Federal Energy Management Program. Available from the National Institute of Science and Technology, formerly National Bureau of Standards (NBS).

1.2.2. The United States Environmental Protection Agency criteria is available from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161 (703) 487-4650: EPA/600/8-88/087, Radon-Resistant Residential New Construction; EPA/625/5-88/024, Application of Radon Reduction Methods; and EPA/625/5-87/019, Radon Reduction Techniques for Detached Houses.

1.2.3. U.S. Department of Transportation, Federal Highways Administration. The Manual On Uniform Traffic Control Devices For Streets and Highways is available from the Superintendent of Documents, U.S. Government Printing Office, Washington D.C. 20402.

1.2.4. Copies of the FIPS publication are for sale by the National Technical Information Service, U.S. Department of Commerce, Springfield, VA 22161.

1.2.5. 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. 20004-1111 (202) 272-5434.

1.2.6 MIL-HDBK 1008C Fire Protection for Facilities Engineering, Design, and Construction may be obtained at the Corps of Engineers Huntsville Engineering and Support Center web site under "Techinfo". The web site address is <http://www.hnd.usace.army.mil/>.

1.3. Non-Government Publications. The following publications form a part of this document to the extent specified elsewhere in this RFP. Unless otherwise specified, the issues of the documents which are Department of Defense (DoD) adopted are those listed in the Department of Defense Index of Specifications & Standards (DODISS).

1.3.1. Air-Conditioning and Refrigeration Institute (ARI). Information listed below is available from ARI, 4301 Fairfax Dr., Suite 425, ATTN: Pubs Dept., Arlington, VA 22203; voice: 703-524-8800; fax: 703-528-3816; Internet E-mail: ari@dgsys.com; Directory of Certified Unitary Air Conditioners, Unitary Heat Pumps and Sound Rated Outdoor Unitary Equipment; ARI 210/240, Unitary Air Conditioning and Air-Source Heat Pump Equipment: <http://www.ari.org/>

1.3.2. Air Movement and Control Association, Inc. (AMCA). AMCA 210, Laboratory Methods of Testing Fans For Rating, is available from AMCA, 30 West University Drive, Arlington Heights, IL 60004 (312) 394-0150: <http://www.amca.org/>

ATTACHMENT 25

1.3.3. American Architectural Manufacturers Association (AAMA) specifications are available from AAMA, 2700 River Road, Suite 118, Des Plaines, IL 60018 (312) 699-7310.

1.3.4. Aluminum Association P.O. Box 753 Waldorf, MD 20601 (301) 843-0159

1.3.5. American Association of State Highway and Transportation Officials; 444 North Capital, NW, Suite 225 Washington, D.C. 20001 (313) 532-2600

1.3.6. American Gas Association (AGA). AGA Z21.1, American National Standard for Household Cooking Gas Appliances, is available from the American Gas Association, 1515 Wilson Blvd., Arlington, VA 22209; voice: 703-841-8556; fax: 703-841-8406: <http://www.aga.org/>.

1.3.7 American National Standards Institute, Inc. (ANSI). Copies of the standards are available from ANSI, 1430 Broadway, New York, N.Y. 10018; voice: 212-642-4900; fax: 212-302-1286: <http://www.ansi.org/>

1.3.8 American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE) documents, are available from ASHRAE, 1791 Tullie Circle, N.E., Atlanta, GA 30329; voice: 404-636-8400; fax: 404-321-5478: <http://www.ashrae.org/>

1.3.9. American Society of Mechanical Engineers (ASME). ASME B16.11, Forged Fittings, Socket-Welding and Threaded is available from ASME; 22 Law Drive; Box 2300; Fairfield, NJ 07007-2900; voice: 800-843-2763; fax: 201-882-1717: <http://www.asme.org/>

1.3.10. American Society of Mechanical Engineers (ASME). ASME A17.1, Safety Code for Elevators and Escalators is available from ASME; 22 Law Drive; Box 2300; Fairfield, NJ 07007-2900; voice: 800-843-2763; fax: 201-882-1717: <http://www.asme.org/>

1.3.11. American Society of Sanitary Engineers (ASSE). ASSE 1006, Residential Use (Household) Dishwashers, ASSE 1017, Thermostatic Mixing valves, and ASSE 1008, Food Waste Disposal Units, Household, are available from ASSE, PO Box 40362, Bay Village, OH 44140; voice: 216-835-3040; fax: 216-835-3488.

1.3.12. American Society for Testing and Materials (ASTM) specifications are available from ASTM, 1916 Race Street, Philadelphia, PA 19103: voice: 215-299-5585; fax: 215-977-9679: <http://www.astm.org/>

1.3.13. 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/>.

1.3.14. Associated Air Balance Council (AABC). AABC MN-1, National Standards for Total System Balance, is available from AABC, 1518 K Street NW, Washington, DC 20005; voice: 202-737-0202; fax: 202-638-4833: <http://www.aabchq.com/>

1.3.15. Builders Hardware Manufacturers Association, Inc. (BHMA). Specifications are available from the Builders Hardware Manufacturers Association, Inc. (BHMA), 355 Lexington Ave.; New York, New York; voice: 212-661-4261; fax: 212-370-9047.

1.3.16. CISPI Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421 (615) 892-0137

1.3.17. Council of American Building Officials (CABO), One and Two Family Dwelling Code and Model Energy Code, are available from The Council of American Building Officials, 5203 Leesburg Pike, Suite 708; Falls Church, Virginia 22041: fax: 703-379-1546: <http://www.intlcode.org/>

ATTACHMENT 25

1.3.18. American National Standards Institute/Telecommunications Industry Association/Electronic Industries Association (ANSI/TIA/EIA) Standards. Standards are available from Global Engineering Documents, 15 Inberness Way East, Inglewood, Colorado, 1(800)854-7179.

1.3.19. Federal Specifications, Order From:

General Services Administration Specification and Consumer Information
Distribution Section (WFSL) Washington Navy Yard, Building 197
Washington, DC 20407

or

Commanding Officer

Naval Publications and Forms Center ATTN: NPODS

5801 Tabor Avenue Philadelphia, Pennsylvania 19120

PH: (215)697-2179 (Govt)

(215) 697-3321 (Industry)

1.3.20. AT&T Hawaii Information Transfer System

Suite D 120

3375 Koapaka St.

Honolulu, Hawaii 96819 Ph: (808) 837-1430

1.3.21. HECO Hawaiian Electric Co. 900 Richards Streets

Honolulu, HI 96813 ph:(808) 548-7311

1.3.22. UBC Uniform Building Code

1997 edition)

1.3.23. HVI Home Ventilating Institute 30 West University Drive

Arlington Heights, Illinois 60004 (312) 394-0150

1.3.24. IEEE Institute of Electrical and Electronics Engineers

445 Hoes Ln. Piscataway, NJ 08854 (908) 981-1393

1.3.25. IOS International Organization for Standardization

1 Rue De Varembe

Case Postale 56 CH-1211 Geneva 20

Switzerland (034) 012-0040

1.3.26. Illuminating Engineering Society (IES), IES Lighting Handbook, is available from Illuminating Engineering Society of North America, 345 East 47th Street, New York, NY 10017.

1.3.27. International Conference of Building Officials (ICBO), Uniform Building Code, is available from the International Conference of Building Officials (ICBO), 5360 South Workman Mill Road, Whittier, CA 90601 (213) 699-0541.

1.3.28. National Association of Architectural Metal Manufacturers Association (NAAMA), Metal Finishes Manual, is available from the National Association of Architectural Metal Manufacturers Association (NAAMA), 600 South Federal Street, Chicago, IL 60605-1842 (312) 922-6222.

1.3.29. National Association of Corrosion Engineers (NACE). NACE RP-0286, The Electrical Isolation of Cathodically Protected Pipelines, is available from NACE, P.O. Box 218340, Houston, Texas 77218.

ATTACHMENT 25

1.3.30. National Association of Plumbing-Heating-Cooling Contractors (PHCC). The National Standard Plumbing Code is available from National Association of Plumbing-Heating-Cooling Contractors (PHCC), PO Box 6808, Falls Church, VA 22046-1148, 1-800-253-4491.

1.3.31. NEC: National Electrical Code (NFPA 70)

1.3.32. National Electrical Manufacturers Association (NEMA) standards is available from the National Electrical Manufacturers Association (NEMA), 2101 L Street N.W., Washington, D.C. 20037 (202) 457-8400

1.3.33. NESC: National Electrical Safety Code (IEEE C2)

1.3.34. National Environmental Balancing Bureau (NEBB). NEBB-01, Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems, is available from NEBB, 1385 Picard Drive, Rockville, MD 20850 (301) 977-3698.

1.3.35. National Fenestration Rating Council (NFRC). NFRC 100-91, Procedure for Determining Fenestration Product Thermal Properties, is available from NFRC, 1300 Spring Street, Suite 120, Silver Spring, MD, (301) 589-NFRC.

1.3.36. National Fire Protection Association, Inc. (NFPA) codes are available from the National Fire Protection Association, Inc. (NFPA), Battery March Park, Quincy, MA 02269 (617) 770-3000.

1.3.37. National Sanitation Foundation, 3475 Plymouth Road, P.O. Box 1468, Ann Arbor, MI 48106 (313) 769-8010.

1.3.38. National Wood Window and Door Association (NWWDA) standard, NWWDA I.S.2, Standard for Wood Window Units is available from the National Wood Window and Door Association (NWWDA), 205 Touhy Ave., Des Plaines, IL 60018 (312) 299-5200.

1.3.39. REA RURAL ELECTRIFICATION ADMINISTRATION (REA)
Order From:

1.3.40. USDA-REA-ASD
Room 0180 ATTN: Publications
Washington, DC 20250 (202) 382-8674

1.3.41. Sheet Metal and Air Conditioning Contractors National Association (SMACNA). SMACNA Installation Standards for Residential Heating and Air Conditioning Systems are available from SMACNA, 8224 Old Courthouse Road, Tysons Corner, Vienna VA, 22180.

1.3.42. UBC Uniform Building Code (1997 Edition)
International Conference of building Officials
5360 South Workman Mill Road
Whittier, California 90601 (213) 699-0541
(As amended by the City and County of Honolulu)

1.3.43. UFAS Uniform Federal Accessibility Standards. 1 Apr.88

1.3.44. Underwriters Laboratories, Inc. (UL) Directories are available from the Underwriters Laboratories, Inc. (UL), 333 Pfingston Road, Northbrook, IL 60062; voice: 847-272-8800; fax: 847-509-6220: <http://www.ui.com/>

1.4. U.S. Army Standard Design Packages, see Table 1 below.

ATTACHMENT 25

1.4.1. Battalion Headquarters. The Center of Standardization for battalion headquarters is the Sacramento District Engineer Office. The Current URL is <http://www.spk.usace.army.mil/cespk-ed/cadd/stddesign/>.

1.4.2. Brigade Headquarters. The Center of Standardization for brigade headquarters is the Sacramento District Engineer Office. The Current URL is <http://www.spk.usace.army.mil/cespk-ed/cadd/stddesign/>.

1.4.3. Company Operations Facility. The Center of Standardization for company operations facilities is the Savannah District Engineer Office.

1.4.4. Unaccompanied Enlisted Personnel Housing and Soldier Community Building. The Center of Standardization for unaccompanied enlisted personnel housing and soldier community buildings is the Savannah District Engineer Office.

1.4.5. Enlisted Personnel Dining Facility. The Center of Standardization for enlisted personnel dining facilities is the Norfolk District Engineer Office.

Table 1 U.S. Army Standard Design Packages

Standard Design	Dept of Army Standard Design Package
Small Battalion Headquarters	DEF 171-51-01, Feb 1987
Brigade Headquarters	DEF141-82-01, Feb 1987
Small & Medium Company Operations Facility	DEF 610-41-04, Feb 1994
Unaccompanied Enlisted Personnel Housing	DEF 721-10-02, Jan 1994
Soldier Community Building (300 PN)	DEF 721-10-02, Jan 1995
Enlisted Personnel Dining Facility (300 PN)	DEF 722-10-01, Feb 1996

ATTACHMENT 28

SEISMIC EVALUATION & ANTI-TERRORISM/FORCE PROTECTION
STUDY FOR WHOLE BARRACKS RENEWAL, PHASE 4A
RENOVATIONS OF QUAD "F"
SCHOFIELD BARRACKS, HAWAII

**Seismic Evaluation
& Anti-Terrorism/Force Protection
Study for
Whole Barracks Renewal, Phase 4A
Renovations of Quad “F”
Schofield Barracks, Hawaii
Volume I**

For

**U.S. Corps of Engineers
Fort Shafter, Oahu, HI**

June 29, 2001

Prepared By:



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INTRODUCTION

This independent study report addresses seismic and antiterrorism force protection rehabilitation issues for Quad "F" buildings at Schofield Barracks, Oahu, Hawaii for compliance with the Revised Statement of Work dated 19 April 2001, entitled "*FY01 MCA PN 52265, Whole Barracks Renewal Quad "F" Renovations, Schofield Barracks, Oahu, Hawaii*".

Purpose of Study

The U.S. Army Corps of Engineers (COE) issued a Request For Proposal (RFP) for renovations to Quad "F" at Schofield Barracks, HI. As stated in the RFP, contractors were to design and lay out the Quad "F" renovations, which incorporated requirements to meet seismic and antiterrorism/force protection (AT/FP) criteria while meeting historical preservation standards. SSFM International, Inc. (SSFM) was responsible for the study, evaluation, and recommendation addressing minimum structural criteria established by the RFP. Structural criteria assessed included seismic and blast/progressive collapse loads on the existing system. Our report proposes a suggested retrofit strategy for each structure. This study was not intended to dictate final design; the Design Build contractor is responsible for the final design and retrofit to meet the RFP requirement. In accordance with terms stipulated in the agreement with U.S. Army Engineer District, Honolulu, dated May 15, 2001, SSFM International, Inc. investigated the conditions of existing buildings that compose Quad "F", performed structural analyses, and provided the following repair recommendations and an estimate of probable rehabilitation costs.

SSFM accomplished the work in the following manner:

- A. A design quality control plan (DQCP) and an Accident Prevention Program/Plan was prepared and submitted to COE.
- B. As-built drawings provided by COE were reviewed.
- C. An on-site inspection was conducted on June 6, 2001 by Mr. Bennett Fung, P.E. and Mr. Jeffrey Cudiamat of SSFM, Mr. Michael Miki of Luersen Architects, Inc. (Historical Preservation consultant), and Mr. David Lindsey of the COE (Project Manager) to:
 - 1. Perform general visual inspection of the existing buildings' conditions.
 - 2. Identify structural deficiencies as they related to retrofitting the existing structures.
 - 3. Determine amount of reinforcing in existing concrete masonry unit walls by an ultrasonic test method.

- D. A supplemental on-site inspection was conducted on June 18, 2001 by Mr. Jeoffrey Cudiamat of SSFM and Ms. Hollice Stone, P.E. of Hinman Consulting Engineers (AT/FP consultant) to verify initial observations and measurements from the previous site visit.
- E. The individual Quad "F" buildings were analyzed for compliance with seismic and AT/FP criteria as stated in the RFP documents.
- F. This written letter report summarizes the investigations, conclusions and recommendations prepared.

Seismic Evaluation and Rehabilitation Criteria

Seismic evaluation of the Quad "F" buildings were based on criteria detailed in TI 809-05, "*Seismic Evaluation and Rehabilitation for Existing Buildings*". Minimum standards applicable for assessing and mitigating unacceptable seismic hazards were introduced and discussed. Seismic evaluation was considered for structural, nonstructural, and geotechnical/site hazards.

The minimum seismic performance level deemed appropriate for Quad "F" of potential significant seismic hazard was "Safe Egress" (SE) as stated in Section 4 (Structural) of the RFP documents. Under SE performance levels, building structural systems remain fully safe for occupancy following a design level earthquake. Essential functions are sufficiently disrupted to prevent immediate post-earthquake occupancy of the building. Structural damage is light, allowing fairly rapid post-earthquake repairs.

The Seismic Use Group was determined to be "Standard Occupancy Structures".

Rehabilitation of the Quad "F" building was based on criteria detailed in TI-809-05, and non structural elements shall conform applicable sections in TI-809-04, "*Seismic Design for Buildings*".

Antiterrorism/Force Protection Evaluation and Retrofit Criteria

Refer to the AT/FP report found in Appendix ATFP.

Historical Preservation Criteria

Refer to the Historical Preservation report found in Appendix HP.

BACKGROUND

Description of Buildings

Quad "F" consists of four structures: Buildings 649, 650, 651, and 652. The buildings were designed in the mid-1930's and functioned as the Bachelors Enlisted Quarters for soldiers.

Building 649

Building 649 is a three-story structure rectangular in plan with approximate overall dimensions of 365 feet by 61 feet. The structure will be used for the Brigade Headquarters, an administrative type facility.

Structural system of Building 649 is comprised primarily of concrete moment frames with unreinforced infill masonry walls. Concrete moment frames serve to support gravity loads and resist lateral loads. Suspended floors at each level are either 5 ½" or 6" thick cast-in-place concrete slabs and act as diaphragms. The roof slab is 3 ½" thick cast-in-place concrete and also acts as a diaphragm. These diaphragms distribute building inertial loads into the concrete moment frames throughout the structure. A high roof at the center of the building was constructed using reinforced concrete walls with steel frames and trusses that support the roof metal decking. A concrete slab-on-grade forms the ground floor. Gravity loads are carried into the soil via isolated concrete column footings at the base of each column.

Building 650, 651, & 652

Buildings 650, 651, and 652 are three-story structures rectangular in plan, each structure having two wings located on the interior courtyard sides of the quad. The footprint for the rectangular body of each building encompasses an approximate area of 320 feet by 72 feet and each wing of each building is approximately 36 feet x 33 feet. Building 650 will house the Company Operations Facility (COF), an administrative and maintenance area with an arms vault. Buildings 651 and 652 will become the Unaccompanied Enlisted Personnel Housing (UEPH), living quarters for soldiers.

Structural systems for Buildings 650, 651, and 652 are comprised primarily of concrete moment frames with unreinforced infill masonry walls. Concrete moment frames serve to support gravity loads and resist lateral loads. Suspended floors at each level are either 3 ½" or 4" thick cast-in-place concrete slabs, which act as a diaphragms. The roof slab is 3" thick cast-in-place concrete and also acts as a diaphragm. These diaphragms distribute building inertial loads into the concrete moment frames throughout the structure. A concrete slab-on-grade forms the ground floor. Gravity loads are carried into the soil via isolated concrete column footings at the base of each column.

OBSERVATIONS

Tier 1 Evaluation (Seismic)

A Tier 1 evaluation is a checklist format review detailed in TI-809-05. TI-809-05 largely references Federal Emergency Management Agency (FEMA) 310, "*Handbook for the*

Seismic Evaluation of Buildings – A Prestandard". Table 1 illustrates a truncated list of structural deficiencies and accompanying recommendations that resulted from the Tier 1 evaluation. Tier 1 conclusions also indicated that a Tier 2 investigation was necessary.

Refer to Appendix T for complete Tier 1 evaluation checklists.

Table 1: Evaluation and Recommendations

Building 649

Evaluated under General Basic Structural Checklist and Concrete Frames with Infill Masonry Shear Walls with Stiff Diaphragms

Item being Evaluated	Reason for Deficiency	Recommendation
Structural		
Concrete moment frame	Axial, shear, and flexural capacities in concrete moment frame columns and beams were exceeded.	Provide shear wall structural system. See drawings in Appendix F for wall layouts.
Unreinforced masonry walls (interior and exterior)	<ol style="list-style-type: none"> 1. Connection to moment resisting frame through proper anchorage was nonexistent and therefore inadequate for both in-plane (applicable only for shear wall system analysis) and out-of-plane forces. 2. Did not have capacity to resist out-of-plane forces due to seismic or blast loads. Masonry fragments pose a hazard in seismic or blast event. 	See drawings in Appendix F for unreinforced masonry wall supports. For other walls not shown in figures, demolish and replace existing interior nonbearing partition walls or provide intermediate vertical bracing.
Weak Story	Vertical discontinuity of gymnasium concrete walls from 3 rd floor to 2 nd floor.	Provide continuous shear walls under existing wall at all floors.
Concrete Slabs, Beams and Columns	Spalling, damage, or deterioration of existing structural concrete slabs, beams, and columns	Repair damaged areas.
Deterioration of steel	At the cooling tower on the roof, there were visual signs of corrosion for the steel beam supports.	Repair damaged beams.
Wall Panels	Not positively attached to floor.	Provide proper attachment of new or existing walls to floor.
Wall Proportions	Height-to-thickness ratio exceeded established allowable limit.	No action required since a Tier 2 evaluation procedure is available for non-complying walls.
Reinforcing around wall and slab openings.	No reinforcing detected around wall openings. No additional reinforcing detected around wall openings.	No action to be taken under Tier 1 analysis since requirement is applicable only for the "Immediate Occupancy" performance level.

Non-Structural		
Unreinforced masonry walls (interior and exterior)	<ol style="list-style-type: none"> 1. Connection to moment resisting frame through proper anchorage was nonexistent and therefore inadequate for out-of-plane forces. 2. Did not have capacity to resist out-of-plane forces due to seismic or blast loads. Masonry fragments pose a hazard in seismic or blast event. 	See drawings in Appendix F for unreinforced masonry wall supports. For other walls not shown in figures, demolish and replace existing interior nonbearing partition walls or provide intermediate vertical bracing.
Integrated suspended ceiling	Not braced against lateral load induced forces.	Provide diagonal wire or rigid members to structure.
Light fixtures in suspended ceiling and emergency lighting.	Not braced against lateral load induced forces.	Provide proper anchorage.
Tall narrow contents or furniture; Emergency power and other equipment; Fire suppression piping; Toxic substances.	Not anchored or braced against lateral load induced forces.	Provide proper anchorage.
Stud tracks.	Not anchored to floor.	Provide proper anchorage.

Building 650/651/652

Evaluated under General Basic Structural Checklist and Concrete Frames with Infill Masonry Shear Walls with Stiff Diaphragms

Item being Evaluated	Reason for Deficiency	Recommendation
Structural		
Concrete moment frame	Axial, shear, and flexural capacities in concrete moment frame columns and beams were exceeded.	Provide shear wall structural system. See drawings in Appendix F for wall layouts.
Unreinforced masonry walls (interior and exterior)	<ol style="list-style-type: none"> 1. Connection to moment resisting frame through proper anchorage is nonexistent and therefore inadequate for both in-plane (applicable only for shear wall system analysis) and out-of-plane forces. 2. Did not have capacity to resist out-of-plane forces due to seismic or blast loads. Masonry fragments pose a hazard in seismic or blast event. 	See drawings in Appendix F for unreinforced masonry wall supports. For other walls not shown in figures, demolish and replace existing interior nonbearing partition walls or provide intermediate vertical bracing.
Concrete Slabs, Beams and Columns	Spalling, damage, or deterioration of existing structural concrete slabs, beams, and columns	Repair damaged areas.
Deterioration of steel	At the cooling tower on the roof, there were visual signs of corrosion for the steel beam supports.	Repair damaged beams.



Wall Panels	Not positively attached to floor.	Provide proper attachment of new or existing walls to floor.
Wall Proportions	Height-to-thickness ratio exceeded established allowable limit.	No action required since a Tier 2 evaluation procedure is available for non-complying walls.
Reinforcing around wall and slab openings.	No reinforcing detected around wall openings. No additional reinforcing detected around wall openings.	No action to be taken under Tier 1 analysis since requirement is applicable only for the "Immediate Occupancy" performance level.
Non-Structural		
Unreinforced masonry walls (interior and exterior)	1. Connection to moment resisting frame through proper anchorage was nonexistent and therefore inadequate for both out-of-plane forces. 2. Does not have capacity to resist out-of-plane forces due to seismic or blast loads. Masonry fragments pose a hazard in seismic or blast event.	See drawings in Appendix F for unreinforced masonry wall supports. For other walls not shown in figures, demolish and replace existing interior nonbearing partition walls or provide intermediate vertical bracing.
Integrated suspended ceiling	Not braced against lateral induced forces.	Provide diagonal wire or rigid members to structure.
Light fixtures in suspended ceiling and emergency lighting.	Not braced against lateral induced forces.	Provide proper anchorage.
Tall narrow contents or furniture; Emergency power and other equipment; Fire suppression piping; Toxic substances.	Not anchored or braced against lateral induced forces.	Provide proper anchorage.
Stud tracks.	Not anchored to floor.	Provide proper anchorage.

Tier 2 Evaluation

Tier 2 evaluation was also based on criteria detailed in TI-809-05. Tier 2 evaluation differed from Tier 1 since it required use of an analytical procedure in lieu of a structural checklist. The analysis technique chosen was the Linear Static Procedure (LSP) as described in TI-809-05, Section 5.2 and quantified in FEMA 310, Sections 4.2.2 and 4.2.3. Seismic shear forces were calculated in accordance with FEMA 310, Section 3.5.2. Results from the analysis indicated that the existing structural system did not meet minimum Tier 2 standards.

REPAIR RECOMMENDATIONS

Quad "F" existing structures met neither Tier 2 structural acceptance criteria nor AT/FP acceptance criteria. Repairs proposed in this report incorporate improvements to enhance seismic design and meet AT/FP standards, yet comply with the standards necessary for historical preservation. Rehabilitation of the structural system was addressed by seismic design criteria dictated by TI 809-05, which referenced FEMA 273, "NEHRP Guidelines for the Seismic Rehabilitation of Buildings", and by eliminating the hazards exposed by

AT/FP risks without disturbing the original historical appearance of the buildings. Table 2 lists each repair item required by this study. Plans for the repairs are illustrated on figures in Appendix F. As stated in the RFP, in order to allow for design innovation and economy, this document should be used for guidance only. A final design may vary substantially with the layout illustrated; however, the issues addressed in this report shall be accounted for through rational analysis developed by an appropriately licensed engineer.

Table 2: Retrofit List

Building 649

Retrofit repairs listed are in conjunction with layouts illustrated on drawings in Appendix F.

Repair retrofits listed in Table 2 and shown on drawings in Appendix F supercede any comments listed in Appendix ATFP. Other retrofit recommendations not listed in Table 2, yet recommended in Appendix ATFP shall be provided.

Location	Floors	Element	Retrofit	Issues
Line A (between lines 1 and 2.3; 18.7 and 20)	All Floors	Infill Walls	6" Shotcrete Wall.	Blast and Progressive Collapse. See Note 1.
Line A (between lines 2.3 and 18.7)	Second Floor	Beam	18" x 26" beam.	Progressive Collapse.
Line A (between lines 2.3 and 18.7)	Third Floor	Beam	18" x 22" beam.	Progressive Collapse.
Line B (between 2 and 19)	All Floors	Infill Wall	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast. See Note 1.
Line E (between 1 and 20)	First and Second Floors	Infill Wall	8" Shotcrete wall with 2 layers of reinforcement and shear ties.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line E (between 1 and 8; 13 and 20)	Third Floor	Infill Wall	8" Shotcrete wall with 2 layers of reinforcement and shear ties.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line E (between 8 and 13)	Third Floor Auditorium Wall	Concrete Wall	Replace with 8" Concrete wall.	Blast.
Line 1 (between A and E)	All Floors	Infill Wall	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.



Line 2.3 (between A and B)	All Floors	Infill Wall	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 8 (between B and E)	All Floors	New Interior Wall	10" concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 10 (between A and E)	First Floor	Infill Walls	6" Shotcrete wall.	Blast. See Note 1.
Lines 10 to 11 (between E and A)	First Floor	Slab above	6" concrete slab system; slab beams: 15" x 10"; slab girder: 24" x 12".	Blast.
Line 11 (between A and E)	First Floor	Infill Walls	6" Shotcrete wall	Blast. See Note 1.
Line 13 (between B and E)	All Floors	New Interior Wall	10" concrete wall Foundation: New concrete strip footing.	Seismic.
Line 18.7 (between A and B)	All Floors	Infill Wall	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 20 (A to E)	All Floors	Infill Wall	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
All Interior Slabs	Under Roof, Third and Second Floor Slabs	Roof and Slabs	Place geotextile at top of all interior slabs.	Blast.
All Exterior Lines	All Floors	Windows	Install 3/8" laminated annealed glass, with min 1.6" bite on lines 1, 20 and E. Install 1/4" laminated annealed glass with min 1" bite at all other locations	Blast. See Note 3.

Building 650

Retrofit repairs listed are in conjunction with layouts illustrated on drawings in Appendix F.

Repair retrofits listed in Table 2 and shown on drawings in Appendix F supercede any comments listed in Appendix ATFP. Other retrofit recommendations not listed in Table 2, yet recommended in Appendix ATFP shall be provided.



Location	Floors	Element	Retrofit	Issues
Line A (between 1 and 25)	First Floor	Infill Walls	10" Shotcrete wall. Windows to be removed and replaced with minimal fenestration. Windows to be at center of wall. Wall shall be anchored top and bottom. Anchorage to be combination of through bolts and angles.	Primary: Blast and Progressive Collapse. See Note 1; Secondary: Seismic.
Line A (between 1 and 2; 24 and 25)	Second and Third Floors	Infill walls	6" Shotcrete wall.	Blast and Progressive Collapse. See Note 1.
Line A (between 2 and 24)	Third Floor	Corridor Beam	18" x 20" beam.	Progressive Collapse.
Line A and B (between 2 and 24)	Second Floor	Slab System	<u>Girder along line B:</u> 18" x 14"; <u>Slab Beams:</u> 14" x 12"; <u>Slab:</u> 7" concrete slab.	Blast.
Line B (between 2 and 9; 17 and 24)	First Floor	Columns	Increase column size from 16" x 16" to 24" x 24".	Seismic.
Line B (between 2 and 24)	Second and Third Floors	Infill Wall	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast. See Note 1.
Line E (between 1.7 and 3; 11 and 12.3; 13.7 and 18.7; 19.3 and 24.3)	First Floor	Infill Walls	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast. See Note 1.
Line E (between 3 and 11; 12.3 and 13.7; 18.7 and 19.3)	First Floor	New Interior Wall	6" Concrete wall.	Primary: Seismic.
Line E (between 1.7 and 12.3; 13.3 and 24.3)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast. See Note 1.
Line F (between 1 and 1.7; 12.3 and 13.7; 24.3 and 25)	First Floor	Infill Walls	6" Shotcrete wall.	Blast and Progressive Collapse. See Note 1
Line F (between 2.5 and 3; 11 and 11.5; 16 and 18.7; 19.3 and 22.4)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line F (between 6 and 8; 18 and 20)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line F (between 12.3 and 13.7)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Blast and Progressive Collapse. See Note 1.



Line F (between 1.7 and 12.3; 13.7 and 24.3)	First Floor	Corridor Beam	18" x 24" beam.	Progressive Collapse.
Line F (between 1.7 and 12.3; 13.7 and 24.3)	Second and Third Floors	Corridor Beam	18" x 24" beam.	Progressive Collapse.
Line G.2 (between 10 and 11.5)	First Floor	Corridor Beam	18" x 24" beam.	Progressive Collapse.
Line J (between 6 and 8; 18 and 20)	Second Floor	Beam	22" x 11.5" beam.	Progressive Collapse.
Line J (between 6 and 8; 18 and 20)	Third Floor	Beam	22" x 11.5" beam.	Progressive Collapse.
Line J (between 6 and 8; 18 and 20)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 1 (between A and F)	All Floors	Infill Walls	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line 1.7 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 2 (between A and B)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Blast. See Note 1.
Line 2.5 (between F and H)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 2.9 (between E and F)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 5 (between C and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 6 (between H and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 6 (between F and J)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 6 (between F and J)	Third Level	Beam	10" x 20" beam.	Progressive Collapse.
Line 8 (between F and J)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 8 (between F and J)	Third Level	Beam	10" x 20" beam.	Progressive Collapse.
Line 9 (between C and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.



Line 10 (between G.5 and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 11 (between E and F)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 11.5 (between F and G.5)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 12.3 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 13 (between B and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 13.7 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 16 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 18 (between F and J)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 18 (between F and J)	Third Level	Beam	10" x 20" beam.	Progressive Collapse.
Line 18.7 (between E and F)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 19 (between B and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 19.3 (between E and F)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 20 (between F and J)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 20 (between F and J)	Third Floor	Beam	10" x 20" beam.	Progressive Collapse.
Line 22 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 24 (between A and B)	Second and Third Floors	Infill Walls	Geotextile fabric with 9 x 9 x 1/2" TS around window frames	Blast. See Note 2.
Line 24.3 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.

Line 25 (between A and F)	All Floors	Infill Walls	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
All Interior Slabs	Under Roof, Third and Second Floor Slabs	Roof and Slabs	Place geotextile at top of all interior slabs.	Blast.
All Exterior Lines	All Floors	Windows	Install 3/8" laminated annealed glass, with min 1.6" bite on lines 1, 25, A and B. Install 1/4" laminated annealed glass with min 1" bite at all other locations.	Blast. See Note 3.

Building 651, 652

Retrofit repairs listed are in conjunction with layouts illustrated on drawings in Appendix F.

Repair retrofits listed in Table 2 and shown on drawings in Appendix F supercede any comments listed in Appendix ATFP. Other retrofit recommendations not listed in Table 2, yet recommended in Appendix ATFP shall be provided.

Location	Floors	Element	Retrofit	Issues
Line A (between 1 and 2; 24 and 25)	All Floors	Infill walls	6" Shotcrete wall.	Blast and Progressive Collapse. See Note 1.
Line A (between 2 and 24)	First Floor	Infill Walls	8" Shotcrete wall .	Primary: Blast and Progressive. See Note 1. Secondary: Seismic.
Line A (between 2 and 24)	Second Floor	Corridor Beam	18"x 24" beam.	Progressive Collapse.
Line A (between 2 and 24)	Third Floor	Corridor Beam	18"x 20" beam.	Progressive Collapse.
Line A and B (between 2 and 24)	All Floors	Slab System	<u>Slab Beams:</u> 9 1/2" x 11". <u>Slabs:</u> 4" concrete slab.	Blast –this is balanced design between the slab system and the wall girder.



Line B (between 2 and 24)	Second and Third Floors	Infill Wall	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line E (between 1.7 and 6.7; 7.3 and 12.3; 13.7 and 18.7; 19.3 and 24.3)	First Floor	Infill Wall	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line E (between 1.7 and 12.3; 13.7 and 24.3)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line F (between 1 and 1.7; 12.3 and 13.7; 24.3 and 25)	All Floors	Infill Walls	6" Shotcrete wall.	Blast and Progressive Collapse. See Note 1.
Line F Between 1.7 and 12.3; 13.7 and 24.3)	Second and Third Floors	Corridor Beam	18" x 24" beam.	Progressive collapse.
Line J (between 4 and 10; 16 and 22)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line J (between 6 and 8; 18 and 20)	Second Floor	Beam	22" x 11 1/2" beam.	Progressive collapse
Line J (between 6 and 8; 18 and 20)	Third Floor	Beam	22" x 11 1/2" beam.	Progressive Collapse
Line J (between 6 and 8; 18 and 20)	Second and Third Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 1 (between A and F)	All Floors	Infill Walls	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.
Line 1.3 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 2 (between A and B)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Blast. See Note 1.
Line 4 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 6 (between F and J)	Second and Third Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 6 (between F and J)	Third Floor	Beam	10" x 20" beam.	Progressive Collapse.



Line 7 (between B and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 8 (between F and J)	Second and Third Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 8 (between F and J)	Third Floor	Beam	10" x 20" beam.	Progressive Collapse
Line 10 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2
Line 12.3 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 13 (between B and E)	All Floors	New Interior Wall	8" Concrete wall. Foundation: New concrete strip footing.	Seismic.
Line 13.7 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2
Line 16 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2
Line 18 (between F and J)	Second and Third Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2
Line 18 (between F and J)	Third Level	Beam	10" x 20" beam.	Progressive Collapse.
Line 20 (between F and J)	Second and Third Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 20 (between F and J)	Third Level	Beam	10" x 20" beam.	Progressive Collapse.
Line 22 (between F and J)	First Floor	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 24 (between A and B)	Second and Third Floors	Infill Walls	6" Shotcrete wall.	Blast. See Note 1
Line 24.3 (between E and F)	All Floors	Infill Walls	Geotextile fabric with 5 x 5 x 3/8" TS frames around windows.	Blast. See Note 2.
Line 25 (between A and F)	All Floors	Infill Walls	6" Shotcrete wall. Foundation: New concrete strip footing.	Primary: Seismic; Secondary: Blast and Progressive Collapse. See Note 1.



All Exterior Lines	All Floors	Windows	Install 3/8" laminated annealed glass, with min 1.6" bite on lines 1, 25, A and B. Install 1/4" laminated annealed glass with min 1" bite at all other locations.	Blast. See Note 3.
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NOTES:

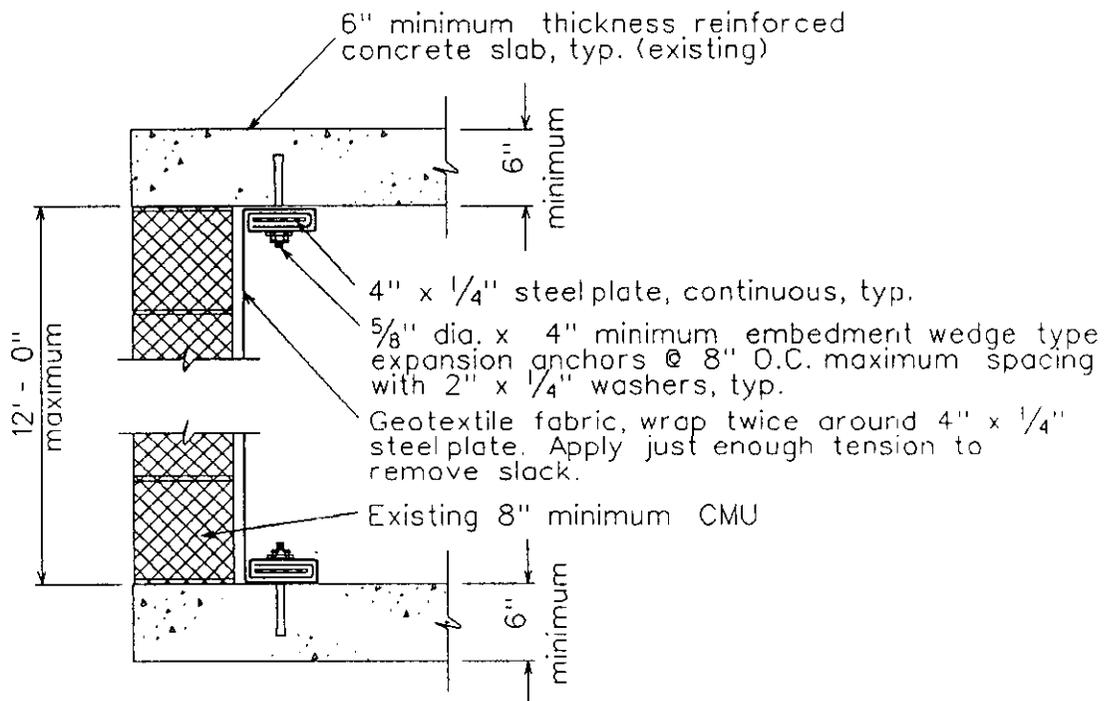
- 1) Existing wall to have surface preparation per ETL110 ("Engineering and Design Air Blast Protection Retrofit for Unreinforced Concrete Masonry Walls", Army Corp of Engineers, October 13, 1998) and anchored per attached sketches D-1 or D-2 with the addition of steel angles at top and bottom. Other requirements per attached notes D-3. Where the slab thickness is inadequate, anchorage shall be engineered. New shotcrete wall to have a minimum of #6 bars at 6" oc each way unless otherwise noted.
- 2) Use Comtrac R 500 geotextile (or equal) and install per attached sketch C-1. Where the slab thickness is inadequate, anchorage shall be engineered. New shotcrete walls to be continuous for length of building. TS to span floor to floor and to be through-bolted to slabs. TS to be installed above and below windows, spanning between the vertical members. Windows to be attached to TS frames. Fabric to be attached to horizontal members and slabs above and below. Maximum distance between vertical members shall be 8 feet. Vertical members shall have horizontal framing members attached to one side only.
- 3) All glass to be laminated annealed (or laminated tempered where required by code). Frames to be a minimum 1/8" thick aluminum. No small, intermediate muntins are allowed. False muntins may be used for architectural purposes. Panes larger than 35" x 35" will require intermediate structural mullions to reduce pane size. Minimum anchorage into shotcrete walls shall be 3/8" dia anchorbolts at 8" on center (special inspection required.)
- 4) Concrete shall have minimum compressive strength (f'c) of 4000

D-3 NOTES:

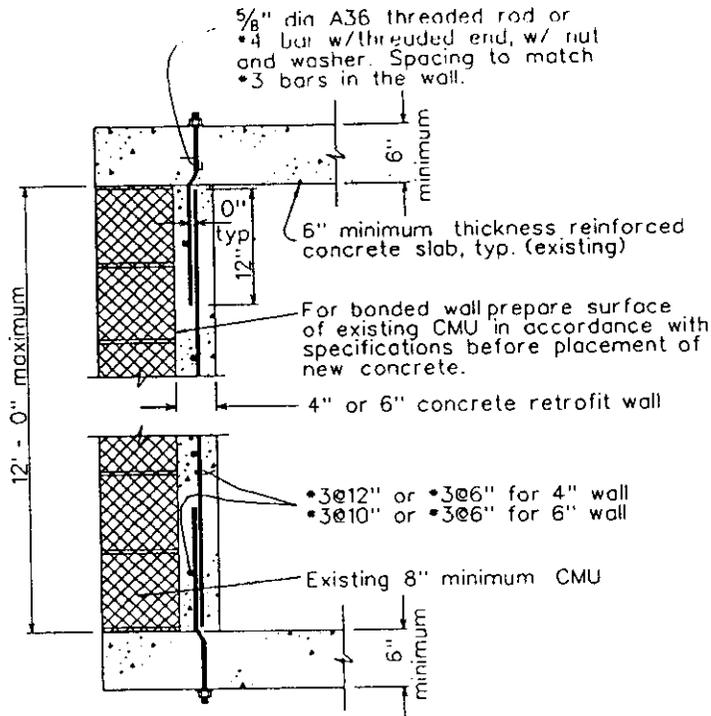
- 1) The width of the window opening must not exceed 80% of the vertical span of the retrofit wall.
- 2) The concrete backing wall must be placed behind any CMU wall above and below the window as well as both sides.
- 3) Additional vertical reinforcing bars must be placed in the backing wall on each side of the opening. The amount of additional vertical reinforcing must equal or exceed the amount of vertical reinforcing interrupted by the opening, with half placed on each side. The additional bars should be distributed evenly in the backing wall close to the opening and over a wall width such that the reinforcing ratio in that width does not exceed 75% of the balanced strain reinforcing ratio (per ACI 318). The additional bars must extend full height of the wall and be anchored into the existing structure in the same manner as the other bars.
- 4) If the width of wall between any two window openings is insufficient for placement of the additional reinforcing required in 3), these two windows and the space between must be considered as a single opening width in 1).

C.1. General Description.

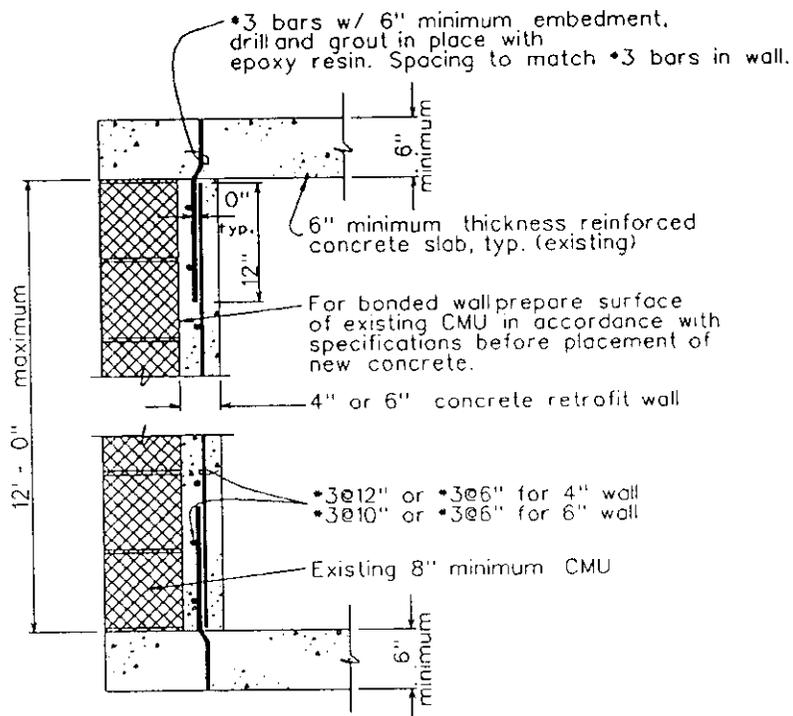
A curtain of geotextile fabric is placed behind the CMU wall covering the entire inside face of the wall. In the event of an explosion the fabric serves to catch broken pieces of the wall, preventing them from flying into the protected space causing injury to the occupants. This retrofit method is effective, relatively inexpensive, uses lightweight materials and is easy to install. It is not applicable to walls with windows, as the fabric must span continuously from floor to ceiling without interruption, nor is it an aesthetically pleasing solution. A cross-section showing installation details is shown in Figure C-1.



C-1. Geotextile Fabric Retrofit Cross Section.



D-1. Four or Six Inch Backing Wall with Through-Bolt Anchorage.



D-2. Four or Six Inch Backing Wall with Epoxy Resin Anchorage.



PROBABLE REPAIR COST

In addition to retrofits listed in the table above, the following retrofits shall be prepared for all buildings:

- 1) All interior unreinforced masonry walls shall be removed or retrofitted.
- 2) All non structural elements shown as nonconforming in the Tier 1 checklist shall be removed and replaced or properly braced and bolted down.
- 3) Support for roof cooling tower shall be retrofitted as needed.

In providing opinions of probable construction cost, the CLIENT understands that SSFM has no control over costs or the price of labor, materials, or equipment, or over the Contractor's method of pricing, and that the opinions of probable construction costs provided herein are to be made on the basis of SSFM's qualifications and experience. SSFM makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bid or actual costs.

The probable cost as recommended in this study to structurally rehabilitate Quad "F" to meet seismic requirements and AT/FP criteria was calculated in Appendix CE.

DISCLAIMER AND QUALIFICATIONS

The opinions and recommendations contained in this report are based on the visual observations and as-built construction documents as performed under the scope of this project. 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.

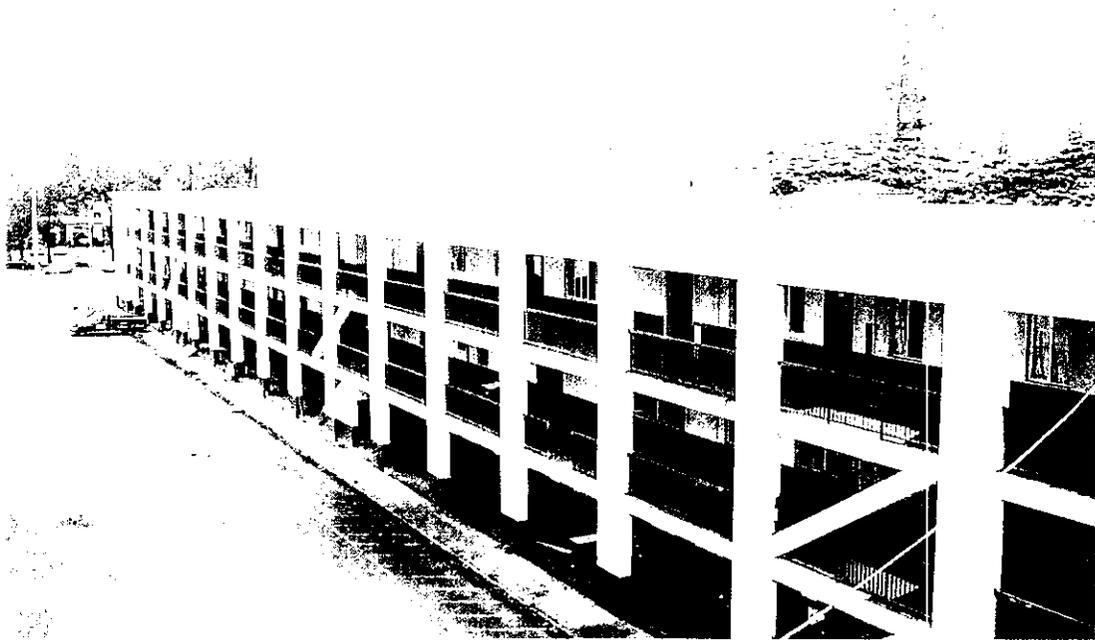
APPENDIX P
PHOTOGRAPHS



Building 649 – Photograph P0005234



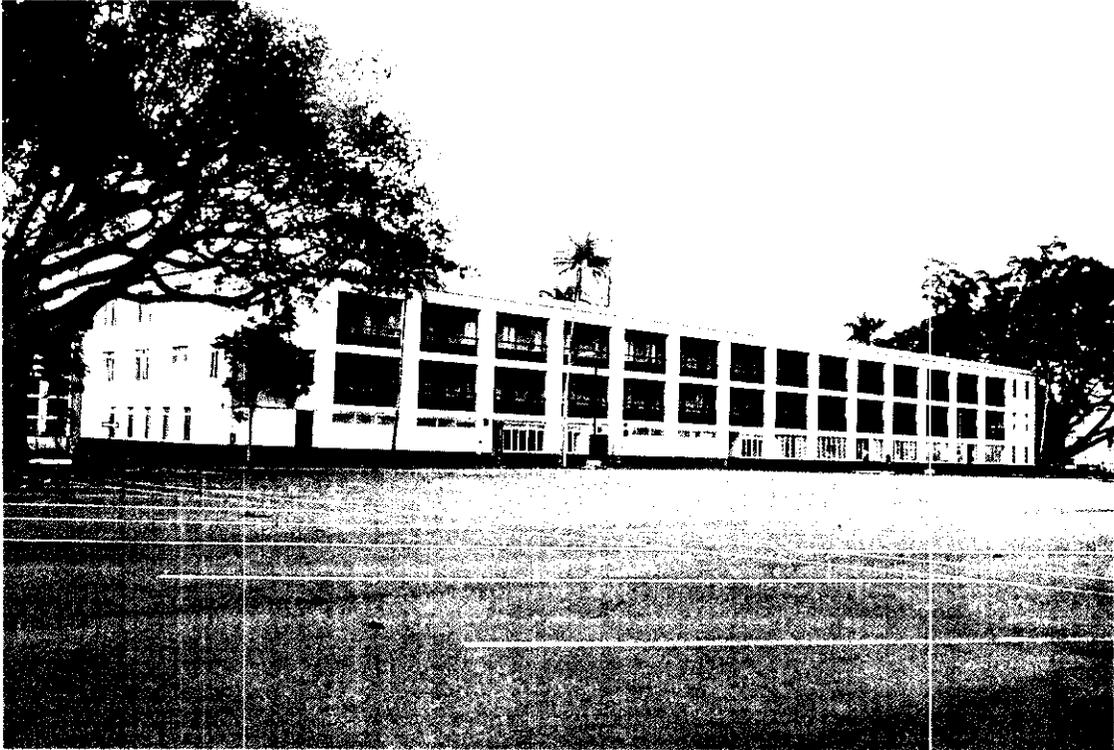
Building 649 – Photograph P0005227



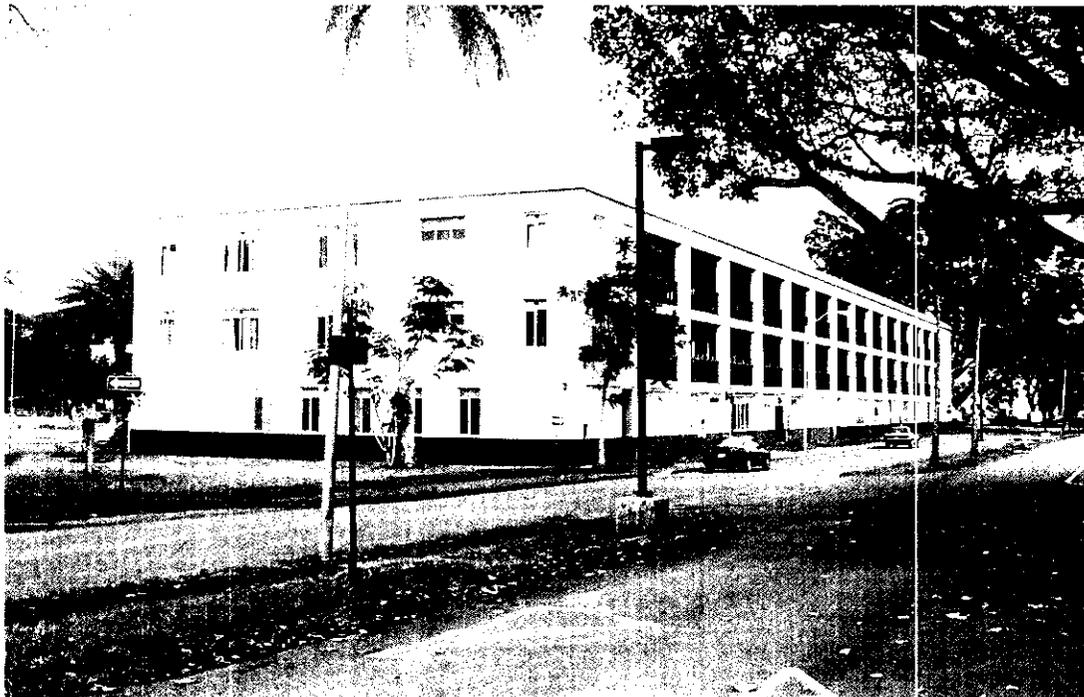
Building 649 – Photograph P0005206



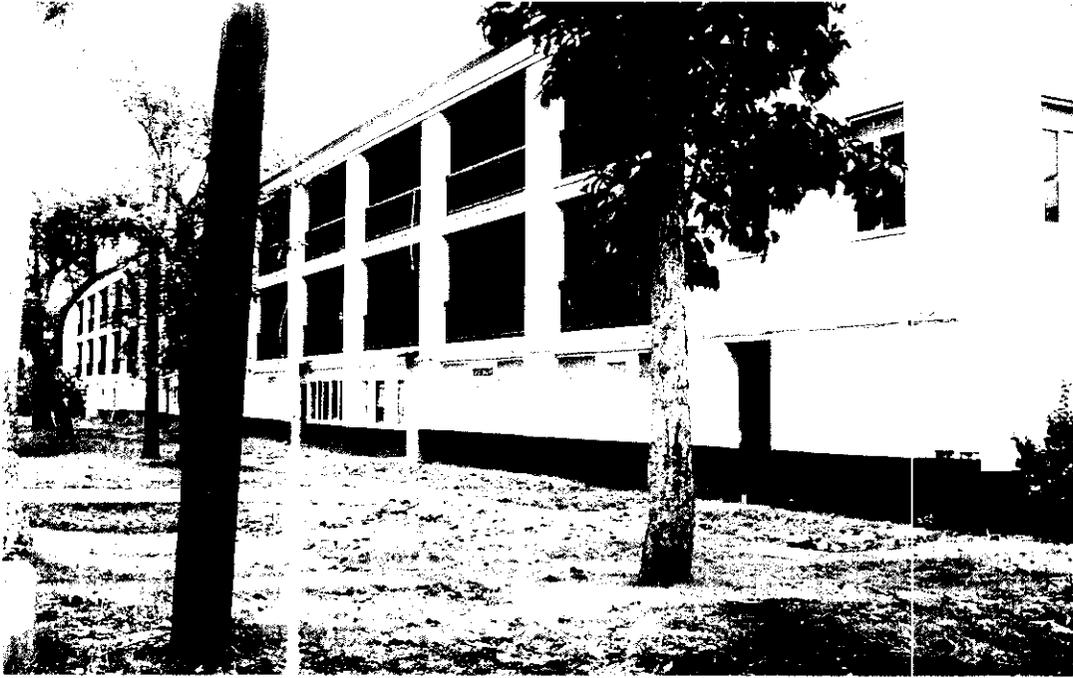
Building 650 – Photograph P0005221



Building 650 – Photograph P0005209



Building 650 – Photograph P0005211



Building 651 – Photograph P0005199



Building 651 – Photograph P0005216



Building 652 – Photograph P0005229



Building 652 – Photograph P0005218

APPENDIX F

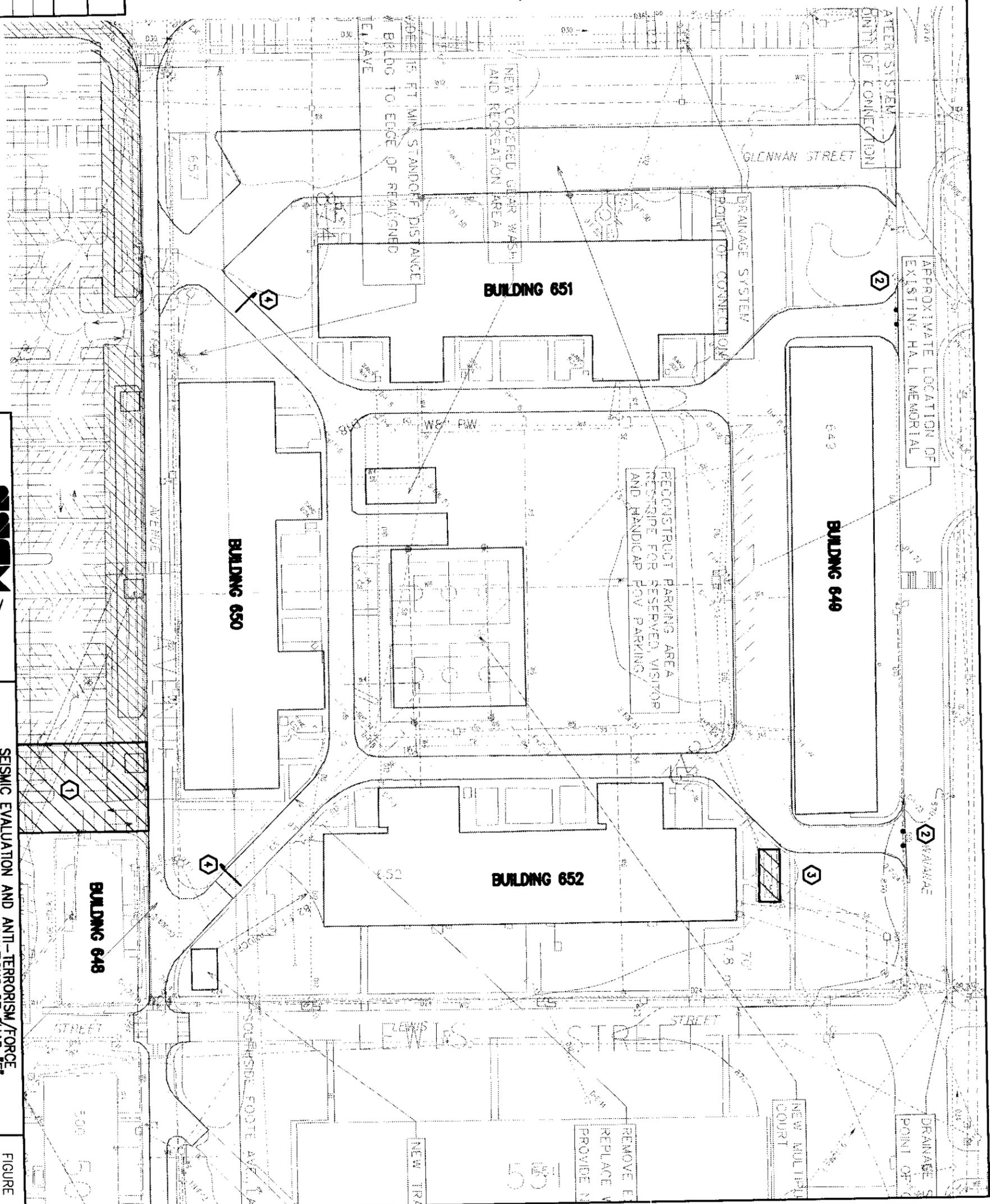
FIGURES

GENERAL NOTES FOR ALL DRAWINGS

- 1) EXISTING WALL TO HAVE SURFACE PREPARATION PER ETL110 (ENGINEERING AND DESIGN AIR BLAST PROTECTION RETROFIT FOR UNREINFORCED CONCRETE MASONRY WALLS" ARRY CORP OF ENGINEERS, OCTOBER 13, 1998) AND ANCHORED PER D-1 OR D-2 WITH THE ADDITION OF STEEL ANGLES AT TOP AND BOTTOM. OTHER REQUIREMENTS PER NOTES D-3 (SEE NOTE 5), WHERE THE SLAB THICKNESS IS INADEQUATE, ANCHORAGE SHALL BE ENGINEERED. NEW SHOTCRETE WALL TO HAVE A MINIMUM OF #6 BARS AT 8" OC EACH WAY UNLESS OTHERWISE NOTED.
- 2) USE CONTRAC R 500 GEOTEXTILE FABRIC (OR EQUIV) AND INSTALL PER C-1 (SEE NOTE 5), WHERE THE SLAB THICKNESS IS INADEQUATE, ANCHORAGE SHALL BE ENGINEERED. NEW SHOTCRETE WALLS TO BE CONTINUOUS FOR LENGTH OF BUILDING. TS TO SPAN FLOOR TO FLOOR AND TO BE THROUGH-BOLTED TO SLABS. TS TO BE INSTALLED ABOVE AND BELOW WINDOWS, SPANNING BETWEEN THE VERTICAL MEMBERS. WINDOWS TO BE ATTACHED TO TS FRAMES. FABRIC TO BE ATTACHED TO HORIZONTAL MEMBERS AND SLABS ABOVE AND BELOW. MAXIMUM DISTANCE BETWEEN VERTICAL MEMBERS SHALL BE 8 FEET. VERTICAL MEMBERS SHALL HAVE HORIZONTAL FRAMING MEMBERS ATTACHED TO ONE SIDE ONLY.
- 3) ALL GLASS TO BE LAMINATED ANNEALED (OR LAMINATED TEMPERED WHERE REQUIRED BY CODE). FRAMES TO BE A MINIMUM 1/8" THICK ALUMINUM. NO SMALL INTERMEDIATE MUNTINS ARE ALLOWED. FALSE MUNTINS MAY BE USED FOR ARCHITECTURAL PURPOSES. PANNES LARGER THAN 35" X 35" WILL REQUIRE INTERMEDIATE STRUCTURAL MULLIONS TO REDUCE PANE SIZE. MINIMUM ANCHORAGE INTO SHOTCRETE WALLS SHALL BE 3/8" DIA ANCHOR BOLTS AT 8" ON CENTER (SPECIAL INSPECTION REQUIRED.)
- 4) CONCRETE SHALL HAVE MINIMUM COMPRESSIVE STRENGTH (f'_c) OF 4000.
- 5) REFER TO REPORT PAGES 16, 17, AND 18 FOR D-1, D-2, C-1 AND NOTES D-3.

SITE RETROFIT SCHEDULE

DENOTATION	DESCRIPTION
①	PROVIDE REQUIRED AT/FP STANDOFF TO BUILDING 648.
②	PROVIDE REMOVABLE BOLLARDS.
③	PROVIDE GRATING OR FENCING TO COVER THE TRANSFORMER ENCLOSURE.
④	PROVIDE CARD ACCESS BARRIER ARMS.



SITE PLAN

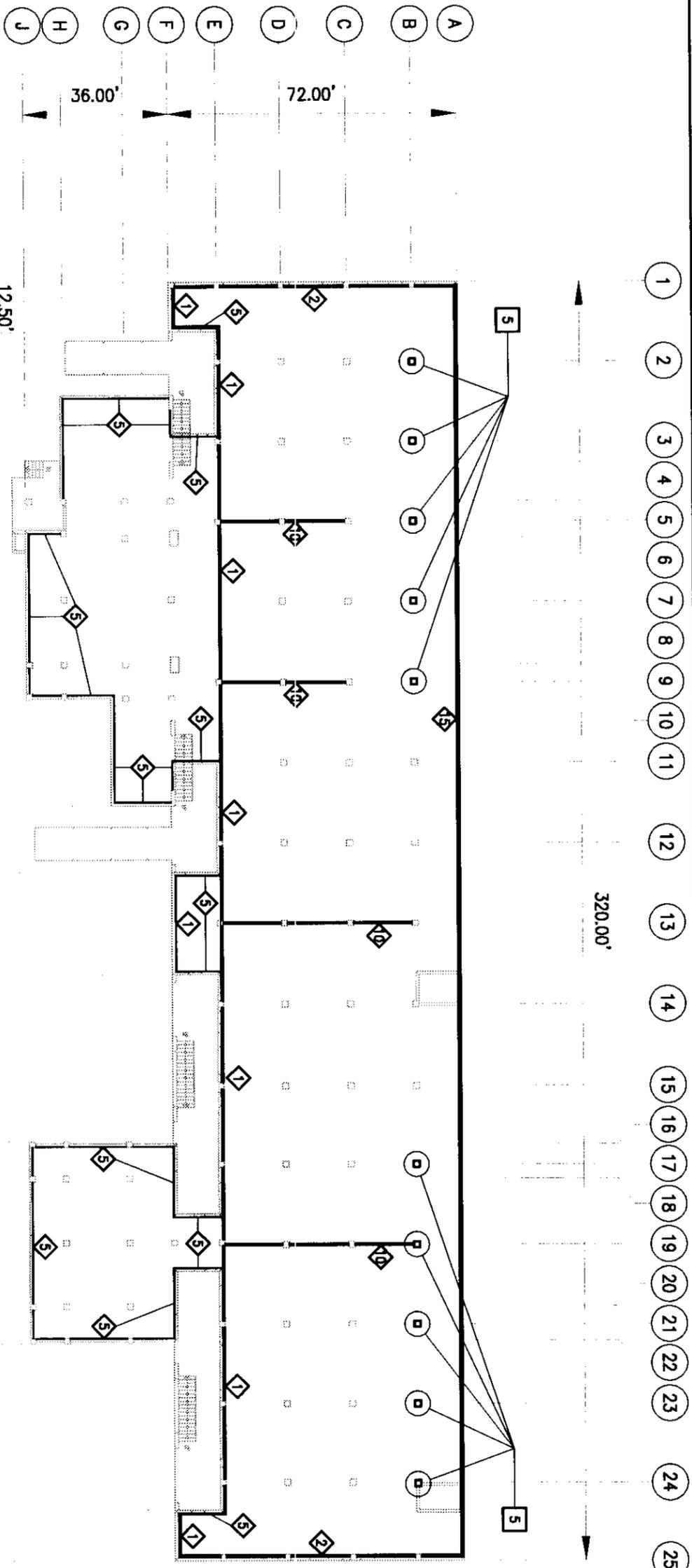
SCALE: 1" = 80'



SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD F, SCHOFIELD BARRACKS, HAWAII
 SITE PLAN

SCALE: AS NOTED DATE: JUNE 29, 2001

FIGURE 1



FIRST FLOOR PLAN

1/32" = 1'-0"

- NOTES**
- 1) SEE GENERAL NOTES.
 - 2) WINDOWS: SEE GENERAL NOTE 3. INSTALL 3/8" LAMINATED ANNEALED GLASS WITH MINIMUM 1.6" BITE ON LINES 1, 25 AND A AND B. INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3) INTERIOR SLABS: PLACE GEOTEXTILE FABRIC AT TOP OF ALL INTERIOR SLABS.
 - 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL: SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
2	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES: SEE GENERAL NOTE 1.	2	NEW 22"x11 1/2" BEAM.	2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	REPLACE WITH 8" CONCRETE WALL.	3	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	3	8" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
4	RETROFIT GEOTEXTILE FABRIC WITH 5663/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	4	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	4	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
5	RETROFIT GEOTEXTILE FABRIC WITH 9694/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x26" BEAM.	5	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
6	RETROFIT GEOTEXTILE FABRIC WITH 9694/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x22" BEAM.	6	
7	NEW 8" CONCRETE WALL: NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
8	NEW 10" CONCRETE WALL: NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
9	REPLACE INRILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				



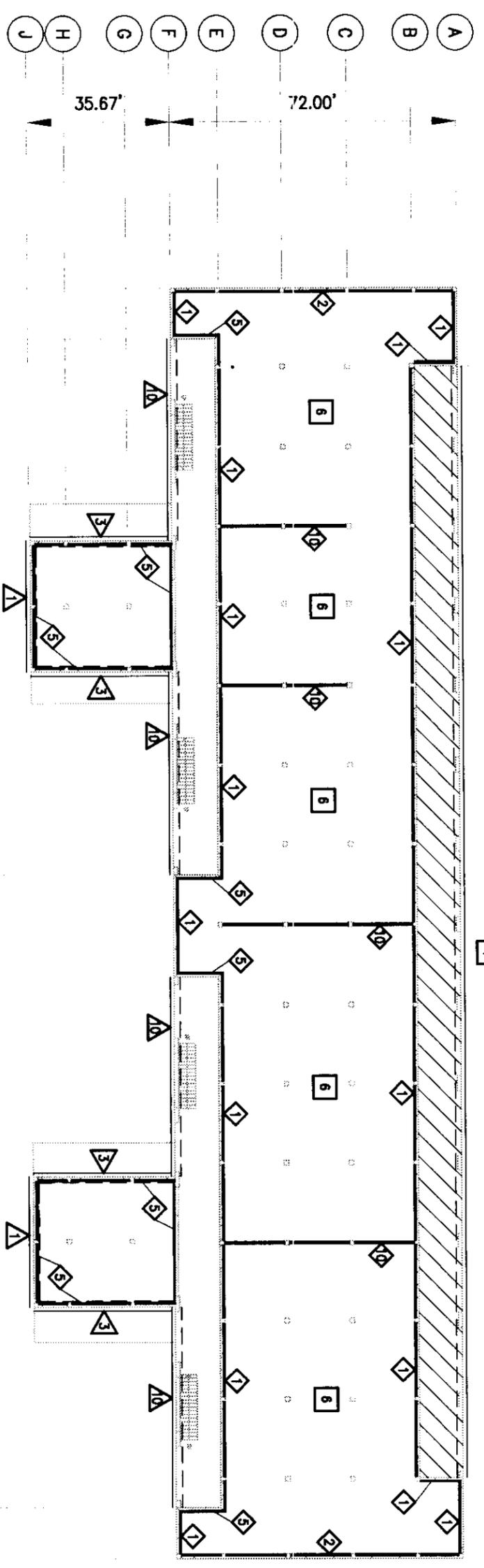
SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD F-1 SCHOFIELD BARRACKS, HAWAII BUILDING 650, FIRST FLOOR PLAN

SCALE: AS NOTED

DATE: JUNE 29, 2001

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

320.00'



SECOND FLOOR PLAN

1/32" = 1'-0"

- NOTES:**
- 1) SEE GENERAL NOTES.
 - 2) WINDOWS: SEE GENERAL NOTE 3. INSTALL 3/8" LAMINATED ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 25 AND A AND B. INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3) INTERIOR SLABS: PLACE GEOTEXTILE FABRIC AT TOP OF ALL INTERIOR SLABS.
 - 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

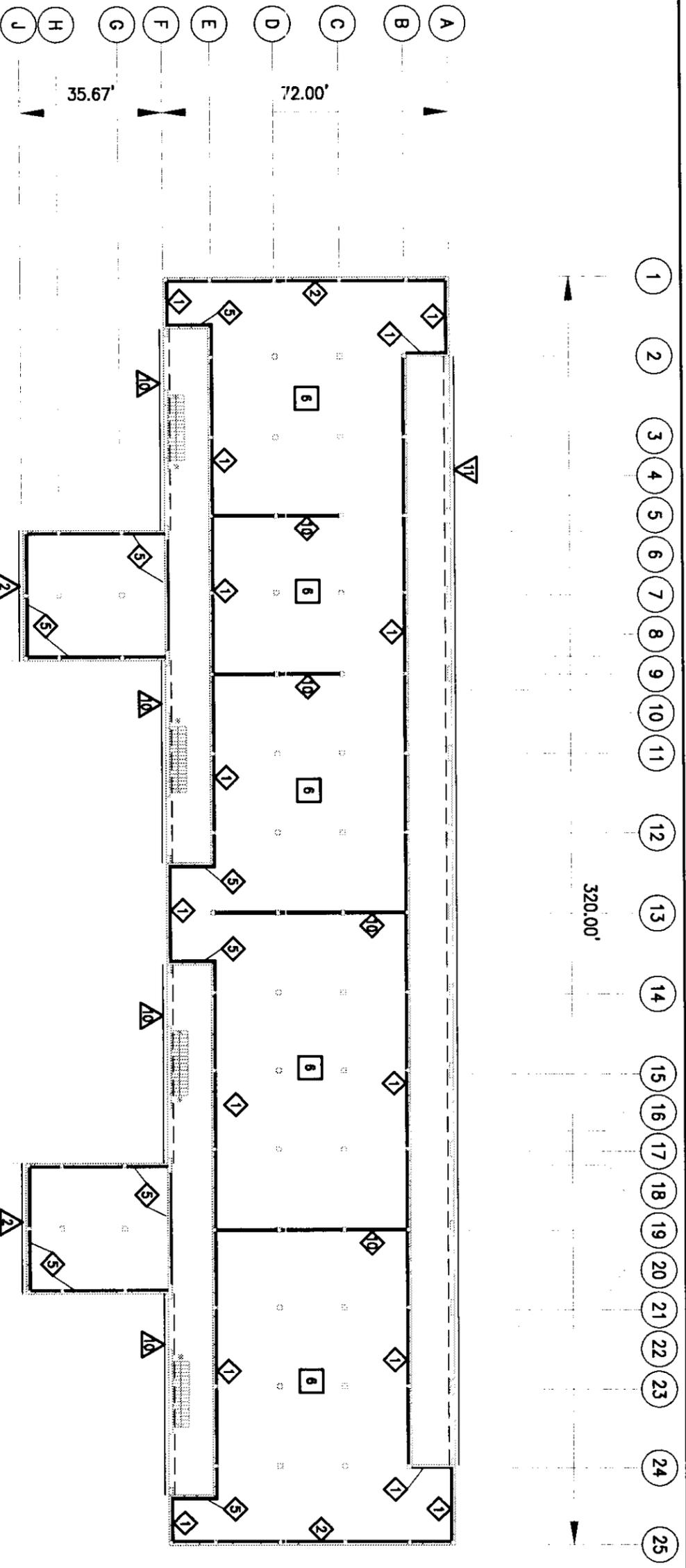
MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL: SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GRIDER: 18"x14"
2	RETROFIT 6" SHOTCRETE WALL: SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.	2	NEW 22"x11 1/2" BEAM.	2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES: SEE GENERAL NOTE 1.	3	NEW 10"x20" BEAM.	3	6" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GRIDER: 24"x12"
4	REPLACE WITH 8" CONCRETE WALL.	4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	4	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
5	RETROFIT GEOTEXTILE FABRIC WITH 5x5x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	5	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
6	RETROFIT GEOTEXTILE FABRIC WITH 9x9x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x26" BEAM.		
7	NEW 8" CONCRETE WALL: NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.		REPLACE EXISTING BEAM WITH 18"x22" BEAM.		
8	NEW 10" CONCRETE WALL: NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
9	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				



SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD "F" BUILDING 650, SECOND FLOOR PLAN

SCALE: AS NOTED DATE: JUNE 29, 2001



THIRD FLOOR PLAN

1/32" = 1'-0"

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

- NOTES:
 1.) SEE GENERAL NOTES.
 2.) WINDOWS: SEE GENERAL NOTE 3; INSTALL 3/8" LAMINATED ANNEALED GLASS WITH MINIMUM 1.6" BITE ON LINES 1, 25 AND A AND B. INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 3.) INTERIOR SLABS: PLACE GEOTEXTILE FABRIC AT TOP OF ALL INTERIOR SLABS.
 4.) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL; SEE GENERAL NOTE 1.
2	RETROFIT 8" SHOTCRETE WALL; SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES; SEE GENERAL NOTE 1.
4	REPLACE WITH 8" CONCRETE WALL.
5	RETROFIT GEOTEXTILE FABRIC WITH 5x6x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.
6	RETROFIT GEOTEXTILE FABRIC WITH 9x8x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.
10	NEW 8" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.
11	NEW 10" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.
15	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.

DESIGNATION	DESCRIPTION
1	NEW 22"x11 1/2" BEAM.
2	NEW 22"x11 1/2" BEAM.
3	NEW 10"x20" BEAM.
10	REPLACE EXISTING BEAM WITH 18"x24" BEAM.
11	REPLACE EXISTING BEAM WITH 18"x20" BEAM.
12	REPLACE EXISTING BEAM WITH 18"x26" BEAM.
13	REPLACE EXISTING BEAM WITH 18"x22" BEAM.

DESIGNATION	DESCRIPTION
1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	6" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
5	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
6	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.

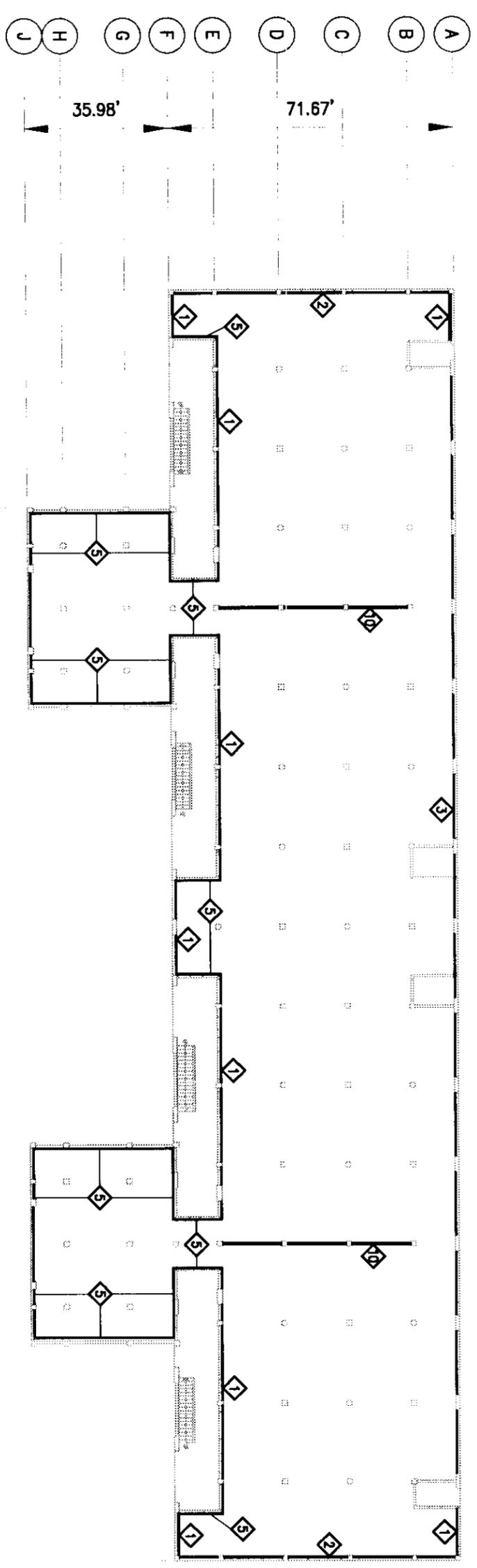


SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD "F" SCHOFFIELD BARRACKS, HAWAII BUILDING 650, THIRD FLOOR PLAN

SCALE: AS NOTED DATE: JUNE 29, 2001

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

320.00'



FIRST FLOOR PLAN
1/32" = 1'-0"

- NOTES:**
- 1) SEE GENERAL NOTES.
 - 2) WINDOWS: SEE GENERAL NOTE 3; INSTALL 3/8" ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 20, AND E; INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3) DOES NOT APPLY TO BUILDING 651.
 - 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

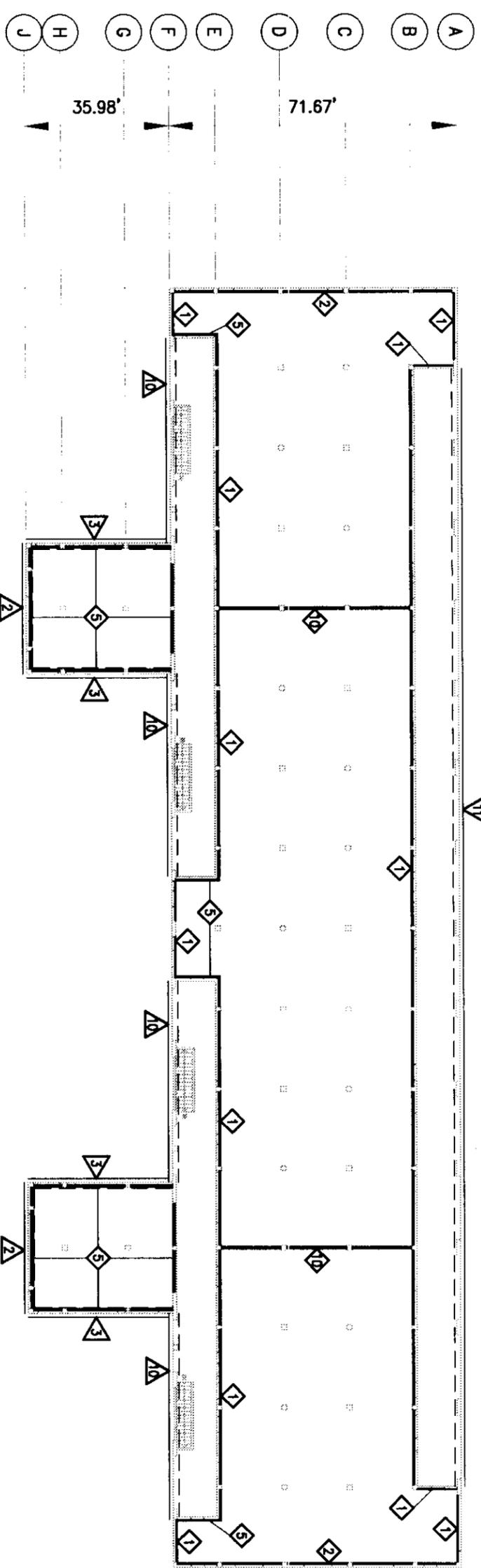
DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL; SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GROSS: 18"x14"
2	RETROFIT 6" SHOTCRETE WALL; SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.	2	NEW 22"x11 1/2" BEAM.	2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES; SEE GENERAL NOTE 1.	3	NEW 10"x20" BEAM.	3	6" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GROSS: 24"x12"
4	REPLACE WITH 8" CONCRETE WALL.	4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	4	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
5	RETROFIT GEOTEXTILE FABRIC WITH 5/8"x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	5	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
6	RETROFIT GEOTEXTILE FABRIC WITH 9/8"x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x28" BEAM.		
7	REPLACE WITH 8" CONCRETE WALL.		REPLACE EXISTING BEAM WITH 18"x22" BEAM.		
8	NEW 8" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
9	NEW 10" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
10	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				



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SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD "F" BUILDING 651, FIRST FLOOR PLAN

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25



THIRD FLOOR PLAN

1/32" = 1'-0"

- NOTES:
- 1) SEE GENERAL NOTES.
 - 2) WINDOWS: SEE GENERAL NOTE 3; INSTALL 3/8" ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 20, AND E; INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3) DOES NOT APPLY TO BUILDING 651.
 - 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL: SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
2	RETROFIT 6" SHOTCRETE WALL: SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.	2	NEW 22"x11 1/2" BEAM.	2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES: SEE GENERAL NOTE 1.	3	NEW 10"x20" BEAM.	3	6" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
4	REPLACE WITH 8" CONCRETE WALL.	4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	4	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
5	RETROFIT GEOTEXTILE FABRIC WITH 5/8x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	5	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
6	RETROFIT GEOTEXTILE FABRIC WITH 9/8x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x26" BEAM.		
7	NEW 8" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.		REPLACE EXISTING BEAM WITH 18"x22" BEAM.		
8	NEW 10" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
9	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				



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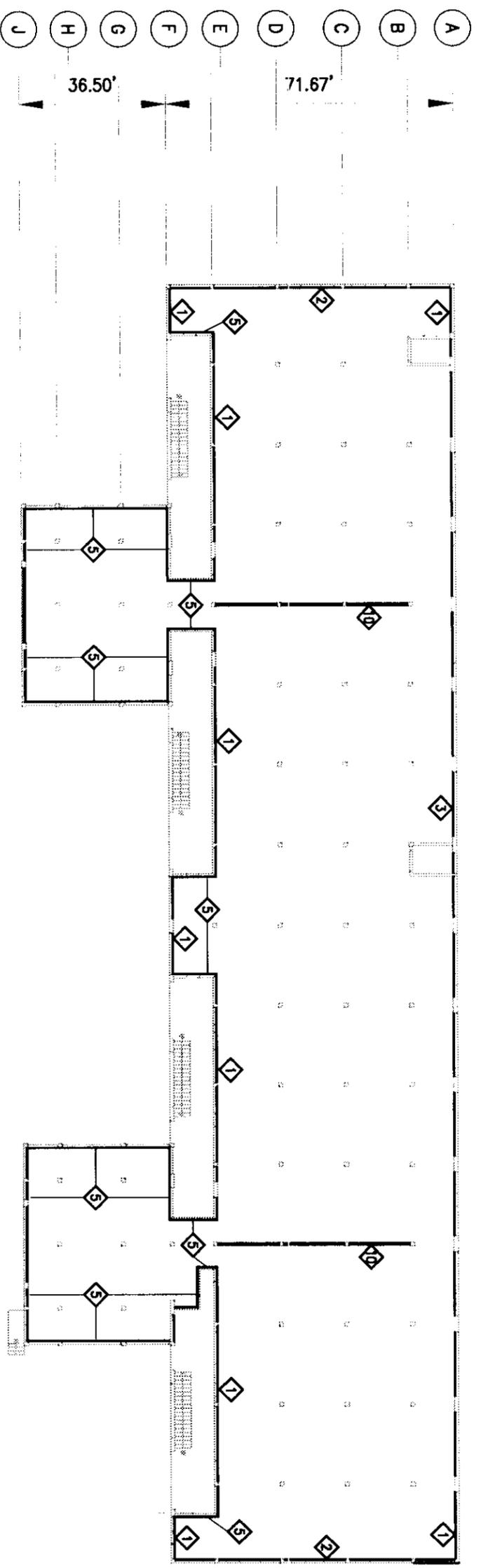
SCALE: AS NOTED

DATE: JUNE 29, 2001

FIGURE
10

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

320.00'



FIRST FLOOR PLAN
1/32" = 1'-0"

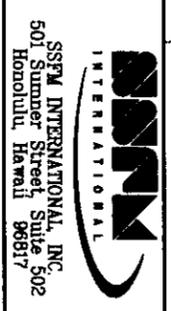
- NOTES:**
- 1.) SEE GENERAL NOTES.
 - 2.) WINDOWS: SEE GENERAL NOTE 3. INSTALL 3/8" ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 20, AND E. INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3.) DOES NOT APPLY TO BUILDING 652.
 - 4.) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 8" SHOTCRETE WALL. SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM.
2	RETROFIT 6" SHOTCRETE WALL. SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.	2	NEW 22"x11 1/2" BEAM.	2	SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES. SEE GENERAL NOTE 1.	3	NEW 10"x20" BEAM.	3	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
4	REPLACE WITH 8" CONCRETE WALL.	4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	4	6" SLAB SYSTEM;
5	RETROFIT GEOTEXTILE FABRIC WITH 5#5x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	5	SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
6	RETROFIT GEOTEXTILE FABRIC WITH 9#4x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x26" BEAM.	6	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24"
10	NEW 8" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.		REPLACE EXISTING BEAM WITH 18"x22" BEAM.		PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
11	NEW 10" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
15	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				



SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD "F" SCHOFIELD BARRACKS, HAWAII BUILDING 652, FIRST FLOOR PLAN

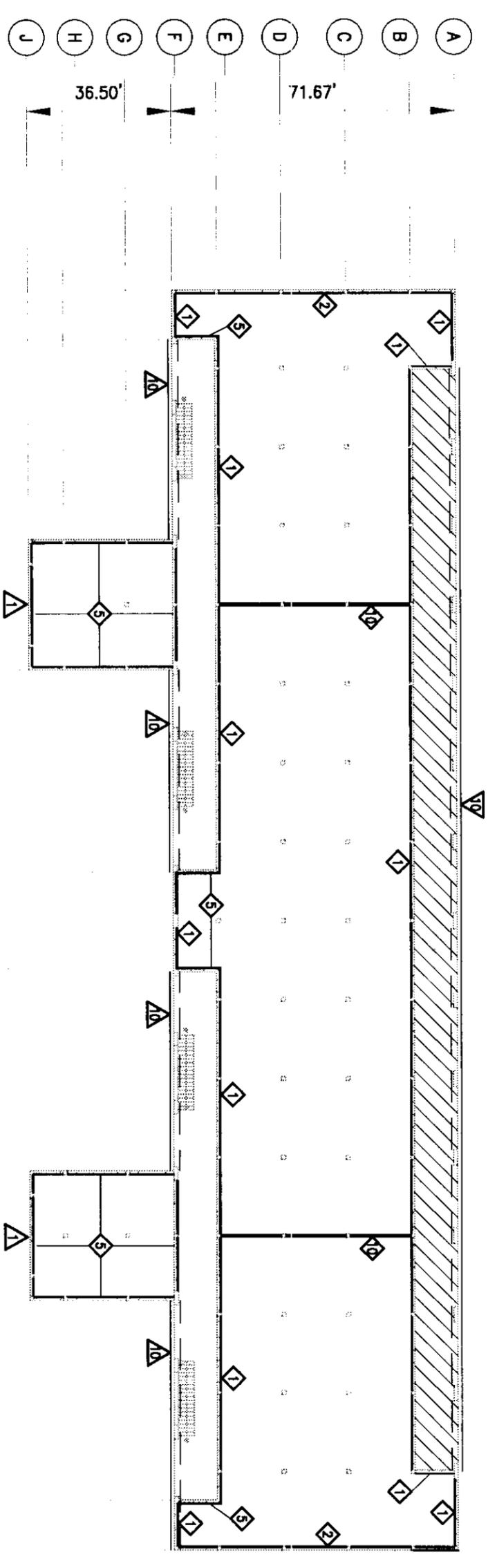
SCALE: AS NOTED

DATE: JUNE 29, 2001

FIGURE 11

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

320.00'



SECOND FLOOR PLAN

1/32" = 1'-0"

- NOTES:
- 1) SEE GENERAL NOTES.
 - 2) WINDOWS: SEE GENERAL NOTE 3; INSTALL 3/8" ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 20, AND E; INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
 - 3) DOES NOT APPLY TO BUILDING 652.
 - 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	RETROFIT 6" SHOTCRETE WALL; SEE GENERAL NOTE 1.
2	RETROFIT 6" SHOTCRETE WALL; SEE GENERAL NOTE 1. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR.
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES; SEE GENERAL NOTE 1.
4	REPLACE WITH 8" CONCRETE WALL.
5	RETROFIT GEOTEXTILE FABRIC WITH 5/8x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.
6	RETROFIT GEOTEXTILE FABRIC WITH 9/8x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.
10	NEW 8" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.
11	NEW 10" CONCRETE WALL; NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.
15	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.

BEAM RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	NEW 22"x11 1/2" BEAM.
2	NEW 22"x11 1/2" BEAM.
3	NEW 10"x20" BEAM.
4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.
5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.
6	REPLACE EXISTING BEAM WITH 18"x22" BEAM.

MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION
1	7" CONCRETE SLAB SYSTEM; SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
2	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
3	6" SLAB SYSTEM; SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
5	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24".
6	PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.

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SEISMIC EVALUATION AND ANTI-TERRORISM/FORCE PROTECTION STUDY FOR RENOVATIONS OF QUAD F-1 SCHOFIELD BARRACKS, HAWAII BUILDING 652, SECOND FLOOR PLAN

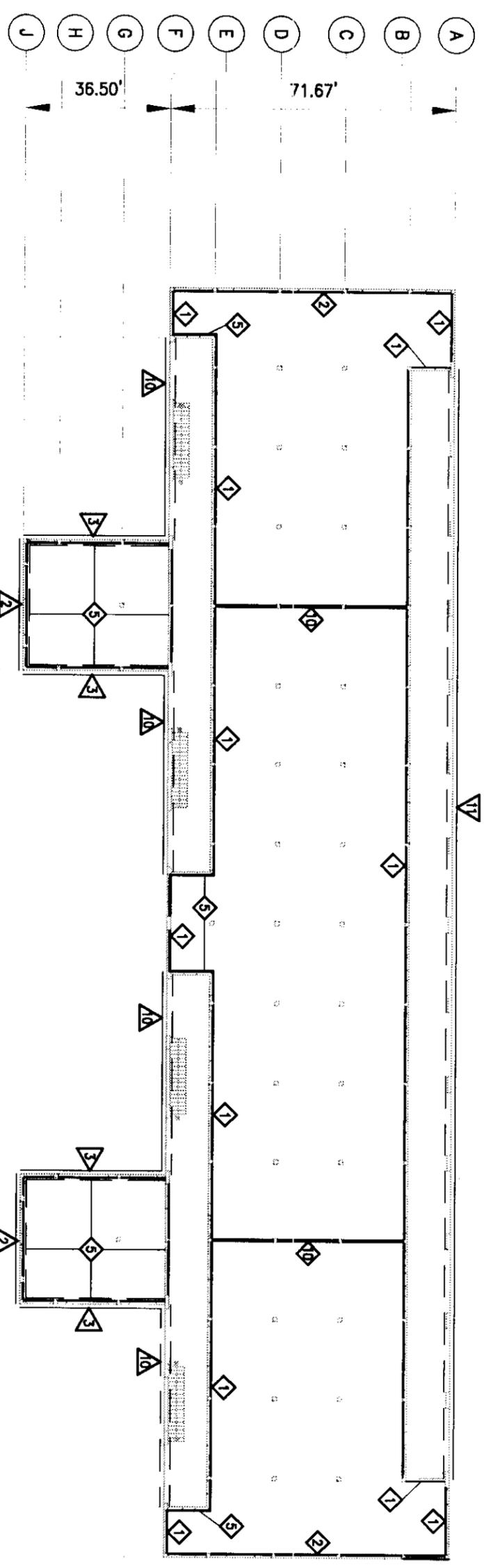
SCALE: AS NOTED

DATE: JUNE 29, 2001

FIGURE 12

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

320.00'



THIRD FLOOR PLAN

1/32" = 1'-0"

NOTES

- 1) SEE GENERAL NOTES.
- 2) WINDOWS: SEE GENERAL NOTE 3; INSTALL 3/8" ANNEALED GLASS WITH MINIMUM 1/8" BITE ON LINES 1, 20, AND E; INSTALL 1/4" LAMINATED ANNEALED GLASS WITH MINIMUM 1" BITE AT ALL OTHER LOCATIONS.
- 3) DOES NOT APPLY TO BUILDING 652.
- 4) ALL MEMBER SIZES AND REINFORCEMENT CALL-OUTS REQUIRE VERIFICATION BY AN APPROPRIATELY LICENSED ENGINEER.

SHEARWALL RETROFIT SCHEDULE

BEAM RETROFIT SCHEDULE

MISCELLANEOUS RETROFIT SCHEDULE

DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION	DESIGNATION	DESCRIPTION
1	RETROFIT 8" SHOTCRETE WALL. SEE GENERAL NOTE 1.	1	NEW 22"x11 1/2" BEAM.	1	7" CONCRETE SLAB SYSTEM;
2	RETROFIT 8" SHOTCRETE WALL. SEE GENERAL NOTE 1.	2	NEW 22"x11 1/2" BEAM.	2	SLAB BEAMS: 14"x12"; SLAB GIRDER: 18"x14"
3	RETROFIT 8" SHOTCRETE WALL WITH 2 LAYERS REINFORCEMENT AND SHEAR TIES. SEE GENERAL NOTE 1.	3	NEW 10"x20" BEAM.	3	REPLACE EXISTING SLAB AND BEAMS WITH NEW 4" SLAB AND 9 1/2"x11" BEAMS.
4	REPLACE WITH 8" CONCRETE WALL.	4	REPLACE EXISTING BEAM WITH 18"x24" BEAM.	4	6" SLAB SYSTEM;
5	RETROFIT GEOTEXTILE FABRIC WITH 5x5x3/8" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	5	REPLACE EXISTING BEAM WITH 18"x20" BEAM.	5	SLAB BEAMS: 15"x10"; SLAB GIRDER: 24"x12"
6	RETROFIT GEOTEXTILE FABRIC WITH 9x9x1/2" TS FRAMING, INCLUDING WINDOWS. SEE GENERAL NOTE 2.	6	REPLACE EXISTING BEAM WITH 18"x26" BEAM.	6	INCREASE COLUMN SIZE FROM 16"x16" TO 24"x24".
7	NEW 8" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.		REPLACE EXISTING BEAM WITH 18"x22" BEAM.		PLACE GEOTEXTILE FABRIC BELOW SUSPENDED SLAB. SEE NOTE 3.
8	NEW 10" CONCRETE WALL. NEW CONCRETE STRIP FOOTING AT FIRST FLOOR. SEE GENERAL NOTE 1 SIM.				
9	REPLACE INFILL WALLS WITH NEW 10" CONCRETE WALL. SEE GENERAL NOTE 1 SIM.				

APPENDIX T
TIER 1 CHECKLISTS

BUILDING 649

3.7.10 Basic Structural Checklist For Building Type C3: Concrete Frames With Infill Masonry Shear Walls And Stiff Diaphragms

This Basic Structural Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Commentary:

This is an older type of building construction that consists of a frame assembly of cast-in-place concrete beams and columns. The floors and roof consist of cast-in-place concrete slabs. Walls consist of infill panels constructed of solid clay brick, concrete block, or hollow clay tile masonry. The seismic performance of this type of construction depends on the interaction between the frame and infill panels. The combined behavior is more like a shear wall structure than a frame structure. Solidly infilled masonry panels form diagonal compression struts between the intersections of the frame members. If the walls are offset from the frame and do not fully engage the frame members, the diagonal compression struts will not develop. The strength of the infill panel is limited by the shear capacity of the masonry bed joint or the compression capacity of the strut. The post-cracking strength is determined by an analysis of a moment frame that is partially restrained by the cracked infill. The shear strength of the concrete columns, after cracking of the infill, may limit the semiductile behavior of the system. The diaphragms consist of concrete floors and are stiff relative to the walls.

Building System

- | | | | |
|-----|------|-------|--|
| (C) | NC | N/A | LOAD PATH: The structure shall contain one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1) |
| C | NC | (N/A) | MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3) |
| C | (NC) | N/A | WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80% of the strength in an adjacent story above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1) |
| C | NC | (N/A) | SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70% of the stiffness in an adjacent story above or below or less than 80% of the average stiffness of the three stories above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2) |
| (C) | NC | N/A | GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 10% in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses. (Tier 2: Sec. 4.3.2.3) |

Chapter 3.0 - Screening Phase (Tier 1)

C	(NC)	N/A	VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
(C)	NC	N/A	MASS: There shall be no change in effective mass more than 50% from one story to the next for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.5)
(C)	NC	N/A	TORSION: The distance between the story center of mass and the story center of rigidity shall be less than 20% of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)
C	(NC)	N/A	DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)
(C)	NC	N/A	MASONRY UNITS: There shall be no visible deterioration of masonry units. (Tier 2: Sec. 4.3.3.7)
(C)	NC	N/A	MASONRY JOINTS: The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no areas of eroded mortar. (Tier 2: Sec. 4.3.3.8)
(C)	NC	N/A	CRACKS IN INFILL WALLS: There shall be no existing diagonal cracks in infill walls that extend throughout a panel, are greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy, or have out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.12)
(C)	NC	N/A	CRACKS IN BOUNDARY COLUMNS: There shall be no existing diagonal cracks wider than 1/8" for Life Safety and 1/16" for Immediate Occupancy in concrete columns that encase masonry infills. (Tier 2: Sec. 4.3.3.13)

Lateral Force Resisting System

(C)	NC	N/A	REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)
C	NC	(N/A)	SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 50 psi for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.4.1)
C	(NC)	N/A	SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 15 psi for clay units and 30 psi for concrete units for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.5.1)
C	(NC)	N/A	WALL CONNECTIONS: All infill walls shall have a positive connection to the frame to resist out-of-plane forces for Life Safety and the connection shall be able to develop the out-of-plane strength of the wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.6.1)

Connections

C	(NC)	N/A	TRANSFER TO SHEAR WALLS: Diaphragms shall be reinforced and connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the shear strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)
(C)	NC	N/A	CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)

3.7.10S Supplemental Structural Checklist For Building Type C3: Concrete Frames With Infill Masonry Shear Walls And Stiff Diaphragms

This Supplemental Structural Checklist shall be completed when required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral Force Resisting System

- (C) NC N/A DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the elements for Life Safety and shall have ductile detailing for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2)
- C NC (N/A) FLAT SLABS: Flat slabs/plates classified as secondary components shall have continuous bottom steel through the column joints for Life Safety. Flat slabs/plates shall not be permitted for the Immediate Occupancy Performance Level. (Tier 2: Sec. 4.4.1.6.3)
- C NC (N/A) REINFORCING AT OPENINGS: All wall openings that interrupt rebar shall have trim reinforcing on all sides. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.3)
- C (NC) N/A PROPORTIONS: The height-to-thickness ratio of the infill walls at each story shall be less than 9 for Life Safety in regions of high seismicity, 13 for Immediate Occupancy in regions of moderate seismicity, and 8 for Immediate Occupancy in regions of high seismicity. (Tier 2: Sec. 4.4.2.6.2)
- C NC (N/A) SOLID WALLS: The infill walls shall not be of cavity construction. (Tier 2: Sec. 4.4.2.6.3)
- C (NC) N/A INFILL WALLS: The infill walls shall be continuous to the soffits of the frame beams. (Tier 2: Sec. 4.4.2.6.4)

Diaphragms

- (C) NC N/A DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors. In wood buildings, the diaphragms shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)
- (C) NC N/A OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25% of the wall length for Life Safety and 15% of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)
- (C) NC N/A PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)
- (C) NC N/A DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragms openings larger than 50% of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Connections

- C NC (N/A) LATERAL LOAD AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

3.7.16 General Basic Structural Checklist

This General Basic Structural Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

BUILDING SYSTEM

General

- (C) NC N/A LOAD PATH: The structure shall contain one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
- (C) NC N/A ADJACENT BUILDINGS: An adjacent building shall not be located next to the structure being evaluated closer than 4% of the height for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.1.2)
- C NC (N/A) MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)

Configuration

- C (NC) N/A WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80% of the strength in an adjacent story above, or below, for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
- C NC (N/A) SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70% of the stiffness in an adjacent story above or below or less than 80% of the average stiffness of the three stories above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
- (C) NC N/A GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30% in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses. (Tier 2: Sec. 4.3.2.3)
- (C) NC N/A VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
- (C) NC N/A MASS: There shall be no change in effective mass more than 50% from one story to the next for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.5)
- (C) NC N/A TORSION: The distance between the story center of mass and the story center of rigidity shall be less than 20% of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

Chapter 3.0 - Screening Phase (Tier 1)

Condition of Materials

- | | | | |
|-----|------|-------|--|
| C | NC | (N/A) | DETERIORATION OF WOOD: There shall be no signs of decay, shrinkage, splitting, fire damage, or sagging in any of the wood members and none of the metal accessories shall be deteriorated, broken, or loose. (Tier 2: Sec. 4.3.3.1) |
| C | NC | (N/A) | OVERDRIVEN FASTENERS: There shall be no evidence of overdriven fasteners in the shear walls. (Tier 2: Sec. 4.3.3.2) |
| C | (NC) | N/A | DETERIORATION OF STEEL: There shall be no visible rusting, corrosion, cracking or other deterioration in any of the steel elements or connections in the vertical- or lateral-force-resisting systems. (Tier 2: Sec. 4.3.3.3) |
| C | (NC) | N/A | DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4) |
| C | NC | (N/A) | POST-TENSIONING ANCHORS: There shall be no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. (Tier 2: Sec. 4.3.3.5) |
| C | NC | (N/A) | PRECAST CONCRETE WALLS: There shall be no visible deterioration of concrete or reinforcing steel or evidence of distress, especially at the connections. (Tier 2: Sec. 4.3.3.6) |
| (C) | NC | N/A | MASONRY UNITS: There shall be no visible deterioration of masonry units. (Tier 2: Sec. 4.3.3.7) |
| (C) | NC | N/A | MASONRY JOINTS: The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no areas of eroded mortar. (Tier 2: Sec. 4.3.3.8) |
| C | NC | (N/A) | CONCRETE WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8" for Life Safety and 1/16" for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.9) |
| C | NC | (N/A) | REINFORCED MASONRY WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8" for Life Safety and 1/16" for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.10) |
| (C) | NC | N/A | UNREINFORCED MASONRY WALL CRACKS: There shall be no existing diagonal cracks in wall elements greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy or out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.11) |
| (C) | NC | N/A | CRACKS IN INFILL WALLS: There shall be no existing diagonal cracks in infill walls that extend throughout a panel, are greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy, or have out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.12) |
| (C) | NC | N/A | CRACKS IN BOUNDARY COLUMNS: There shall be no existing diagonal cracks wider than 1/8" for Life Safety and 1/16" for Immediate Occupancy in concrete columns that encase masonry infills. (Tier 2: Sec. 4.3.3.13) |

LATERAL FORCE RESISTING SYSTEM

Moment Frames

General

- | | | | |
|-----|----|-----|--|
| (C) | NC | N/A | REDUNDANCY: The number of lines of moment frames in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. The number of bays of moment frames in each line shall be greater than or equal to 2 for Life Safety and 3 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.1.1) |
|-----|----|-----|--|

Moment Frames with Infill Walls

- C (NC) N/A INTERFERING WALLS: All infill walls placed in moment frames shall be isolated from structural elements. (Tier 2: Sec. 4.4.1.2.1)

Steel Moment Frames

- C NC (N/A) DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 3.5.3.1, shall be less than 0.025 for Life Safety and 0.015 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.1)

- C NC (N/A) AXIAL STRESS CHECK: The axial stress due to gravity loads in columns subjected to overturning forces shall be less than $0.10F_y$ for Life Safety and Immediate Occupancy. Alternatively, the axial stress due to overturning forces alone, calculated using the Quick Check Procedure of Section 3.5.3.6, shall be less than $0.30F_y$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.2)

Concrete Moment Frames

- C (NC) N/A SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 3.5.3.2, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.1)

- C (NC) N/A AXIAL STRESS CHECK: The axial stress due to gravity loads in columns subjected to overturning forces shall be less than $0.10f'_c$ for Life Safety and Immediate Occupancy. Alternatively, the axial stresses due to overturning forces alone, calculated using the Quick Check Procedure of Section 3.5.3.6, shall be less than $0.30f'_c$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.2)

Precast Concrete Moment Frames

- C NC (N/A) PRECAST CONNECTION CHECK: The precast connections at frame joints shall have the capacity to resist the shear and moment demands calculated using the Quick Procedure of Section 3.5.3.5. (Tier 2: Sec. 4.4.1.5.1)

Frames Not Part of the Lateral-Force-Resisting System

- (C) NC N/A COMPLETE FRAMES: Steel or concrete frames classified as secondary components shall form a complete vertical load carrying system. (Tier 2: Sec. 4.4.1.6.1)

Shear Walls

General

- (C) NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)

Concrete Shear Walls

- C NC (N/A) SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.1)

Chapter 3.0 - Screening Phase (Tier 1)

C NC (N/A) REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be greater than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.2)

C NC (N/A) COLUMN SPLICES: Steel columns encased in shear wall boundary elements shall have splices that develop the tensile strength of the column. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.9)

Precast Concrete Shear Walls

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the precast panels, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.3.1)

C NC (N/A) REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be greater than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.3.2)

Reinforced Masonry Shear Walls

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 50 psi for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.4.1)

C NC (N/A) REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls shall be greater than 0.002 for Life Safety and 0.003 for Immediate Occupancy of the wall with the minimum of 0.0007 for Life Safety and 0.001 for Immediate Occupancy in either of the two directions; the spacing of reinforcing steel shall be less than 48" for Life Safety and 24" for Immediate Occupancy, and all vertical bars shall extend to the top of the walls. (Tier 2: Sec. 4.4.2.4.2)

Unreinforced Masonry Shear Walls

C (NC) N/A SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 15 psi for clay units and 30 psi for concrete units for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.5.1)

Infill Walls in Frames

C (NC) N/A WALL CONNECTIONS: All infill walls shall have a positive connection to the frame to resist out-of-plane forces for Life Safety and the connection shall be able to develop the out-of-plane strength of the wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.6.1)

Walls in Wood-Frame Buildings

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the following values for Life Safety and Immediate Occupancy (Tier 2: Sec. 4.4.2.7.1):

Structural panel sheathing:	1000 plf
Diagonal sheathing:	700 plf
Straight sheathing:	80 plf
All other conditions:	100 plf

Chapter 3.0 - Screening Phase (Tier 1)

- C NC (N/A) STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings shall not rely on exterior stucco walls as the primary lateral-force-resisting system. (Tier 2: Sec. 4.4.2.7.2)
- C NC (N/A) GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard shall not be used as shear walls on buildings over one story in height. (Tier 2: Sec. 4.4.2.7.3)
- C NC (N/A) NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2 to 1 for Life Safety and 1.5 to 1 for Immediate Occupancy shall not be used to resist lateral forces developed in the building. (Tier 2: Sec. 4.4.2.7.4)
- C NC (N/A) WALLS CONNECTED THROUGH FLOORS: Shear walls shall have interconnection between stories to transfer overturning and shear forces through the floor. (Tier 2: Sec. 4.4.2.7.5)
- C NC (N/A) HILLSIDE SITE: For a sloping site greater than one-half story, all shear walls on the downhill slope shall have an aspect ratio less than 1 to 1 for Life-Safety and 1 to 2 for Immediate Occupancy. (Tier 2: Sec. 4.4.2.7.6)
- C NC (N/A) CRIPPLE WALLS: All cripple walls below first floor level shear walls shall be braced to the foundation with shear elements. (Tier 2: Sec. 4.4.2.7.7)

Braced Frames

General

- C NC (N/A) REDUNDANCY: The number of lines of braced frames in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. The number of braced bays in each line shall be greater than 2 for Life Safety and 3 for Immediate Occupancy. (Tier 2: Sec. 4.4.3.1.1)
- C NC (N/A) AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 3.5.3.4, shall be less than 18 ksi or $0.50F_y$ for Life Safety and for Immediate Occupancy. (Tier 2: Sec. 4.4.3.1.2)
- C NC (N/A) COLUMN SPLICES: All column splice details located in braced frames shall develop the tensile strength of the column. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.5)

DIAPHRAGMS

Precast Concrete Diaphragms

- C NC (N/A) TOPPING SLAB: Precast concrete diaphragm elements shall be interconnected by a continuous reinforced concrete topping slab. (Tier 2: Sec. 4.5.5.1)

CONNECTIONS

Anchorage for Normal Forces

- C (NC) (N/A) WALL ANCHORAGE: Exterior concrete or masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors or straps that are developed into the diaphragm. (Tier 2: Sec. 4.6.1.1)

Shear Transfer

- C (NC) N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be reinforced and connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the shear strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)
- C NC (N/A) TRANSFER TO STEEL FRAMES: Diaphragms shall be connected for transfer of loads to the steel frames for Life Safety and the connections shall be able to develop the shear strength of the frames for Immediate Occupancy. (Tier 2: Sec. 4.6.2.2)
- C NC (N/A) TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements shall be doweled into the shear wall or frame elements for Life Safety and the dowels shall be able to develop the shear strength of the walls or frames for Immediate Occupancy. (Tier 2: Sec. 4.6.2.3)

Vertical Components

- C NC (N/A) STEEL COLUMNS: The columns in lateral-force-resisting frames shall be anchored to the building foundation for Life Safety and the anchorage shall be able to develop the tensile capacity of the foundation for Immediate Occupancy. (Tier 2: Sec. 4.6.3.1)
- (C) NC N/A CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)
- C NC (N/A) WOOD POSTS: There shall be a positive connection of wood posts to the foundation. (Tier 2: Sec. 4.6.3.3)
- C NC (N/A) WOOD SILLS: All wood sills shall be bolted to the foundation. (Tier 2: Sec. 4.6.3.4)
- C (NC) N/A WALL REINFORCING: Walls shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.3.5)
- (C) NC N/A SHEAR-WALL-BOUNDARY COLUMNS: The shear wall boundary columns shall be anchored to the building foundation for Life Safety and the anchorage shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.6)
- C NC (N/A) PRECAST WALL PANELS: Precast wall panels shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.3.7)
- C (NC) N/A WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the foundation for Life Safety and the attachment shall be able to develop the shear capacity of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.3.8)

Interconnection of Elements

- (C) NC N/A GIRDER/COLUMN CONNECTION: There shall be a positive connection between the girder and the column support. (Tier 2: Sec. 4.6.4.1)

Panel Connections

- (C) NC N/A ROOF PANELS: Metal, plastic, or cementitious roof panels shall be positively attached to the roof framing to resist seismic forces for Life Safety and the attachment shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.5.1)
- C (NC) N/A WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the framing to resist seismic forces for Life Safety and the attachment shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.5.2)

3.7.16S General Supplemental Structural Checklist

This General Supplemental Structural Checklist shall be completed when required by Table 3-2. The General Basic Structural Checklist shall be completed prior to completing this General Supplemental Structural Checklist.

LATERAL FORCE RESISTING SYSTEM

Moment Frames

Steel Moment Frames

- C NC (N/A) MOMENT-RESISTING CONNECTIONS: All moment connections shall be able to develop the strength of the adjoining members or panel zones. (Tier 2: Sec. 4.4.1.3.3)
- C NC (N/A) PANEL ZONES: All panel zones shall have the shear capacity to resist the shear demand required to develop $0.8\Sigma M_p$ of the girders framing in at the face of the column. (Tier 2: Sec. 4.4.1.3.4)
- C NC (N/A) COLUMN SPLICES: All column splice details located in moment resisting frames shall include connection of both flanges and the web for Life Safety and the splice shall develop the strength of the column for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.5)
- C NC (N/A) STRONG COLUMN/WEAK BEAM: The percent of strong column/weak beam joints in each story of each line of moment resisting frames shall be greater than 50% for Life Safety and 75% for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.6)
- C NC (N/A) COMPACT MEMBERS: All moment frame elements shall meet compact section requirements set forth by the *Load and Resistance Factor Design Specification for Structural Steel Buildings* (AISC, 1993). This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.7)
- C NC (N/A) BEAM PENETRATIONS: All openings in frame-beam webs shall be less than 1/4 of the beam depth and shall be located in the center half of the beams. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.8)
- C NC (N/A) GIRDER FLANGE CONTINUITY PLATES: There shall be girder flange continuity plates at all moment-resisting frame joints. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.9)
- C NC (N/A) OUT-OF-PLANE BRACING: Beam-column joints shall be braced out-of-plane. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.10)
- C NC (N/A) BOTTOM FLANGE BRACING: The bottom flange of beams shall be braced out-of-plane. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.11)

Concrete Moment Frames

- C NC (N/A) FLAT SLAB FRAMES: The lateral-force-resisting system shall not be a frame consisting of columns and a flat slab/plate without beams. (Tier 2: Sec. 4.4.1.4.3)
- C NC (N/A) PRESTRESSED FRAME ELEMENTS: The lateral-load-resisting frames shall not include any prestressed or post-tensioned elements. (Tier 2: Sec. 4.4.1.4.4)
- (C) NC N/A SHORT CAPTIVE COLUMNS: There shall be no columns at a level with height/depth ratios less than 50% of the nominal height/depth ratio of the typical columns at that level for Life Safety and 75% for Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.5)

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| C | (NC) | N/A | NO SHEAR FAILURES: The shear capacity of frame members shall be able to develop the moment capacity at the top and bottom of the columns. (Tier 2: Sec. 4.4.1.4.6) |
| C | (NC) | N/A | STRONG COLUMN/WEAK BEAM: The sum of the moment capacity of the columns shall be 20% greater than that of the beams at frame joints. (Tier 2: Sec. 4.4.1.4.7) |
| (C) | NC | N/A | BEAM BARS: At least two longitudinal top and two longitudinal bottom bars shall extend continuously throughout the length of each frame beam. At least 25% of the longitudinal bars provided at the joints for either positive or negative moment shall be continuous throughout the length of the members for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.8) |
| C | (NC) | N/A | COLUMN-BAR SPLICES: All column bar lap splice lengths shall be greater than $35 d_b$ for Life Safety and $50 d_b$ for Immediate Occupancy and shall be enclosed by ties spaced at or less than $8 d_b$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.9) |
| (C) | NC | N/A | BEAM-BAR SPLICES: The lap splices for longitudinal beam reinforcing shall not be located within $l_d/4$ of the joints and shall not be located within the vicinity of potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.10) |
| C | (NC) | N/A | COLUMN-TIE SPACING: Frame columns shall have ties spaced at or less than $d/4$ for Life Safety and Immediate Occupancy throughout their length and at or less than $8 d_b$ for Life Safety and Immediate Occupancy at all potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.11) |
| C | (NC) | N/A | STIRRUP SPACING: All beams shall have stirrups spaced at or less than $d/2$ for Life Safety and Immediate Occupancy throughout their length. At potential plastic hinge locations stirrups shall be spaced at or less than the minimum of $8 d_b$ or $d/4$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.12) |
| C | (NC) | N/A | JOINT REINFORCING: Beam-column joints shall have ties spaced at or less than $8 d_b$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.13) |
| C | NC | (N/A) | JOINT ECCENTRICITY: There shall be no eccentricities larger than 20% of the smallest column plan dimension between girder and column centerlines. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.14) |
| C | (NC) | N/A | STIRRUP AND TIE HOOKS: The beam stirrups and column ties shall be anchored into the member cores with hooks of 135° or more. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.15) |

Precast Concrete Moment Frames

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| C | NC | (N/A) | PRECAST FRAMES: For buildings with concrete shear walls, lateral forces shall not be resisted by precast concrete frame elements. (Tier 2: Sec. 4.4.1.5.2) |
| C | NC | (N/A) | PRECAST CONNECTIONS: For buildings with concrete shear walls, the connection between precast frame elements such as chords, ties, and collectors in the lateral-force-resisting system shall develop the capacity of the connected members. (Tier 2: Sec. 4.4.1.5.3) |

Frames Not Part of the Lateral-Force-Resisting System

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| C | (NC) | N/A | DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the elements for Life Safety and shall have ductile detailing for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2) |
| C | NC | (N/A) | FLAT SLABS: Flat slabs/plates classified as secondary components shall have continuous bottom steel through the column joints for Life Safety. Flat slabs/plates shall not be permitted for the Immediate Occupancy Performance Level. (Tier 2: Sec. 4.4.1.6.3) |

Shear Walls

Concrete Shear Walls

- C NC (N/A) COUPLING BEAMS: The stirrups in all coupling beams over means of egress shall be spaced at or less than $d/2$ and shall be anchored into the core with hooks of 135° or more for Life Safety and Immediate Occupancy. In addition, the beams have the capacity in shear to develop the uplift capacity of the adjacent wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.3)
- C NC (N/A) OVERTURNING: All shear walls shall have aspect ratios less than 4 to 1. Wall piers need not be considered. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.4)
- C NC (N/A) CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2.0, the boundary elements shall be confined with spirals or ties with spacing less than $8 d_c$. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.5)
- C NC (N/A) REINFORCING AT OPENINGS: There shall be added trim reinforcement around all wall openings. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.6)
- C NC (N/A) WALL THICKNESS: Thickness of bearing walls shall not be less than $1/25$ the minimum unsupported height or length, nor less than 4". This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.7)
- C NC (N/A) WALL CONNECTIONS: There shall be a positive connection between the shear walls and the steel beams and columns for Life Safety and the connection shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.8)

Precast Concrete Shear Walls

- C NC (N/A) WALL OPENINGS: Openings shall constitute less than 75% of the length of any perimeter wall for Life Safety and 50% for Immediate Occupancy with the wall piers having aspect ratios of less than 2. (Tier 2: Sec. 4.4.2.3.3)
- C NC (N/A) CORNER OPENINGS: Walls with openings at a building corner larger than the width of a typical panel shall be connected to the remainder of the wall with collector reinforcing. (Tier 2: Sec. 4.4.2.3.4)
- C NC (N/A) PANEL-TO-PANEL CONNECTIONS: Adjacent wall panels shall be interconnected to transfer overturning forces between panels by methods other than welded steel inserts. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.3.5)
- C NC (N/A) WALL THICKNESS: Thickness of bearing walls shall not be less than $1/25$ the minimum unsupported height or length, nor less than 4". This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.3.6)

Reinforced Masonry Shear Walls

- C NC (N/A) REINFORCING AT OPENINGS: All wall openings that interrupt rebar shall have trim reinforcing on all sides. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.3)
- C NC (N/A) PROPORTIONS: The height-to-thickness ratio of the shear walls at each story shall be less than 30. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.4)

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Unreinforced Masonry Shear Walls

- C NC (N/A) PROPORTIONS: The height-to-thickness ratio of the shear walls at each story shall be less than the following for Life Safety and Immediate Occupancy (Tier 2: Sec. 4.4.2.5.2):
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|--------------------------------------|----|
| Top story of multi-story building: | 9 |
| First story of multi-story building: | 15 |
| All other conditions: | 13 |
- C NC (N/A) MASONRY LAY-UP: Filled collar joints of multiwythe masonry walls shall have negligible voids. (Tier 2: Sec. 4.4.2.5.3)

Infill Walls in Frames

- C (NC) N/A PROPORTIONS: The height-to-thickness ratio of the infill walls at each story shall be less than 9 for Life Safety in regions of high seismicity, 13 for Immediate Occupancy in regions of moderate seismicity, and 8 for Immediate Occupancy in regions of high seismicity. (Tier 2: Sec. 4.4.2.6.2)
- C NC (N/A) SOLID WALLS: The infill walls shall not be of cavity construction. (Tier 2: Sec. 4.4.2.6.3)
- C (NC) N/A INFILL WALLS: The infill walls shall be continuous to the soffits of the frame beams. (Tier 2: Sec. 4.4.2.6.4)

Walls in Wood-Frame Buildings

- C NC (N/A) OPENINGS: Walls with garage doors or other large openings shall be braced with plywood shear walls or shall be supported by adjacent construction through substantial positive ties. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec 4.4.2.7.8)
- C NC (N/A) HOLD-DOWN ANCHORS: All walls shall have properly constructed hold-down anchors. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec 4.4.2.7.9)

Braced Frames

General

- C NC (N/A) STIFFNESS OF DIAGONALS: All diagonal elements required to carry compression shall have KI/r ratios less than 120. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.3)
- C NC (N/A) CONNECTION STRENGTH: All the brace connections shall develop the yield capacity of the diagonals. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.4)
- C NC (N/A) OUT-OF-PLANE BRACING: Braced frame connections attached to beam bottom flanges located away from beam-column joints shall be braced out-of-plane at the bottom flange of the beams. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.6)

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Concentrically Braced Frames

- C NC (N/A) K-BRACING: The bracing system shall not include K-braced bays. (Tier 2: Sec. 4.4.3.2.1)
- C NC (N/A) TENSION-ONLY BRACES: Tension-only braces shall not comprise more than 70% of the total lateral-force-resisting capacity in structures over two stories in height. (Tier 2: Sec. 4.4.3.2.2)
- C NC (N/A) CHEVRON BRACING: The bracing system shall not include chevron, or V-braced bays. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.2.3)
- C NC (N/A) CONCENTRIC JOINTS: All the diagonal braces shall frame into the beam-column joints concentrically. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.2.4)

DIAPHRAGMS

General

- (C) NC N/A DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors. In wood buildings, the diaphragms shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)
- (C) NC N/A CROSS TIES: There shall be continuous cross ties between diaphragm chords. (Tier 2: Sec. 4.5.1.2)
- (C) NC N/A ROOF CHORD CONTINUITY: All chord elements shall be continuous, regardless of changes in roof elevation. (Tier 2: Sec. 4.5.1.3)
- (C) NC N/A OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25% of the wall length for Life Safety and 15% of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)
- C NC (N/A) OPENINGS AT BRACED FRAMES: Diaphragm openings immediately adjacent to the braced frames shall extend less than 25% of the frame length for Life Safety and 15% of the frame length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.5)
- (C) NC N/A OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls shall not be greater than 8 feet long for Life Safety and 4 ft. long for Immediate Occupancy. (Tier 2: Sec. 4.5.1.6)
- (C) NC N/A PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)
- C NC (N/A) DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragms openings larger than 50% of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Wood Diaphragms

- C NC (N/A) STRAIGHT SHEATHING: All straight sheathed diaphragms shall have aspect ratios less than 2 to 1 for Life Safety and 1 to 1 for Immediate Occupancy in the direction being considered. (Tier 2: Sec. 4.5.2.1)
- C NC (N/A) SPANS: All wood diaphragms with spans greater than 24 ft. for Life Safety and 12 ft. for Immediate Occupancy shall consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Tier 2: Sec. 4.5.2.2)

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C NC (N/A) UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms shall have horizontal spans less than 40 ft. for Life Safety and 25 ft. for Immediate Occupancy and shall have aspect ratios less than or equal to 4 to 1 for Life Safety and 3 to 1 for Immediate Occupancy. (Tier 2: Sec. 4.5.2.3)

C NC (N/A) ASPECT RATIO: All wood diaphragms with an aspect ratio greater than 3 to 1 for Life Safety and 2 to 1 for Immediate Occupancy shall have nonstructural walls connected to all diaphragm levels at a spacing less than 40 ft. for Life Safety and 25 ft. for Immediate Occupancy. (Tier 2: Sec. 4.5.2.4)

Metal Deck Diaphragms

C NC (N/A) NON-CONCRETE DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete shall consist of horizontal spans of less than 40 ft. and shall have aspect ratios less than 4 to 1. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.3.1)

Other Diaphragms

C NC (N/A) OTHER DIAPHRAGMS: The diaphragm shall not consist of a system other than those described in Section 4.5. (Tier 2: Sec. 4.5.7.1)

CONNECTIONS

Anchorage for Normal Forces

C NC (N/A) WOOD LEDGERS: The connection between the wall panels and the diaphragm shall not induce cross-grain bending or tension in the wood ledgers. (Tier 2: Sec. 4.6.1.2)

C (NC) N/A ANCHOR SPACING: Exterior masonry walls shall be anchored to the floor and roof systems at a spacing of 4 ft. or less for Life Safety and 3 ft. or less for Immediate Occupancy. (Tier 2: Sec. 4.6.1.3)

C NC (N/A) PRECAST PANEL CONNECTIONS: There shall be at least two anchors from each precast wall panel into the diaphragm elements for Life Safety and the anchors shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.1.4)

C NC (N/A) STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements shall be installed taut and shall be stiff enough to prevent movement between the wall and the diaphragm. If bolts are present, the size of the bolt holes in both the connector and framing shall be a maximum of 1/16" larger than the bolt diameter. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.6.1.5)

Vertical Components

C NC (N/A) WOOD SILL BOLTS: Sill bolts shall be spaced at 6 ft. or less for Life Safety and 4 ft. or less for Immediate Occupancy, with proper edge distance provided for wood and concrete. (Tier 2: Sec. 4.6.3.9)

C NC (N/A) LATERAL LOAD AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

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Interconnection of Elements

- C NC (N/A) GIRDERS: Girders supported by walls or pilasters shall have at least two additional ties to secure the anchor bolts for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.6.4.2)
- C NC (N/A) CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing shall be greater than 3" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.6.4.3)
- C NC (N/A) CORBEL CONNECTIONS: The frame girders shall not be connected to corbels with welded elements. (Tier 2: Sec. 4.6.4.4)

Panel Connections

- C NC (N/A) ROOF PANEL CONNECTIONS: Roof panel connections shall be spaced at or less than 12" for Life Safety and 8" for Immediate Occupancy. (Tier 2: Sec. 4.6.5.3)

3.8 Geologic Site Hazards And Foundations Checklist

This Geologic Site Hazards and Foundations Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Geologic Site Hazards

The following statements shall be completed for buildings in regions of high or moderate seismicity.

- (C) NC N/A LIQUEFACTION: Liquefaction susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet under the building for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.1.1)
- C NC (N/A) SLOPE FAILURE: The building site shall be sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or shall be capable of accommodating any predicted movements without failure. (Tier 2: Sec. 4.7.1.2)
- (C) NC N/A SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site is not anticipated. (Tier 2: Sec. 4.7.1.3)

Condition of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

- (C) NC N/A FOUNDATION PERFORMANCE: There shall be no evidence of excessive foundation movement such as settlement or heave that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.1)

The following statement shall be completed for buildings in regions of high or moderate seismicity being evaluated to the Immediate Occupancy Performance Level.

- (C) NC N/A DETERIORATION: There shall not be evidence that foundation elements have deteriorated due to corrosion, sulfate attack, material breakdown, or other reasons in a manner that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.2)

Capacity of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

- C NC (N/A) POLE FOUNDATIONS: Pole foundations shall have a minimum embedment depth of 4 ft. for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.3.1)

The following statements shall be completed for buildings in regions of high seismicity and for buildings in regions of moderate seismicity being evaluated to the Immediate Occupancy Performance Level.

- (C) NC N/A OVERTURNING: The ratio of the effective horizontal dimension, at the foundation level of the lateral-force-resisting system, to the building height (base/height) shall be greater than 0.6S_w. (Tier 2: Sec. 4.7.3.2)

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| ③ | NC | N/A | TIES BETWEEN FOUNDATION ELEMENTS: The foundation shall have ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Class A, B, or C. (Tier 2: Sec. 4.7.3.3) |
| C | NC | ③ | DEEP FOUNDATIONS: Piles and piers shall be capable of transferring the lateral forces between the structure and the soil. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.4) |
| C | NC | ③ | SLOPING SITES: The grade difference from one side of the building to another shall not exceed one-half the story height at the location of embedment. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.5) |

3.9 Nonstructural Checklists

The following checklists are included in this Section:

- Basic Nonstructural Component Checklist, and
- Supplemental Nonstructural Component Checklist.

These checklists shall be completed when required by Table 3-2. The Basic Nonstructural Component Checklist shall be completed prior to completing the Supplemental Nonstructural Component Checklist.

3.9.1 Basic Nonstructural Component Checklist

This Basic Nonstructural Component Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Partitions

- C (NC) N/A UNREINFORCED MASONRY: Unreinforced masonry or hollow clay tile partitions shall be braced at a spacing of equal to or less than 10 feet in regions of low and moderate seismicity and 6 feet in regions of high seismicity. (Tier 2: Sec. 4.8.1.1)

Ceiling Systems

- C (NC) N/A INTEGRATED CEILINGS: Integrated suspended ceilings at exits and corridors or weighing more than 2 lb/ft² shall be laterally restrained with a minimum of 4 diagonal wires or rigid members attached to the structure above at a spacing of equal to or less than 12 ft. (Tier 2: Sec. 4.8.2.1)
- C (NC) N/A LAY-IN TILES: Lay-in tiles used in ceiling panels located at exitways and corridors shall be secured with clips. (Tier 2: Sec. 4.8.2.2)
- C (NC) N/A SUPPORT: The integrated suspended ceiling system shall not be used to laterally support the tops of gypsum board, masonry, or hollow clay tile partitions. (Tier 2: Sec. 4.8.2.3)
- C NC (N/A) SUSPENDED LATH AND PLASTER: Ceilings consisting of suspended lath and plaster or gypsum board shall be attached for each 10 square feet of area. (Tier 2: Sec. 4.8.2.4)

Light Fixtures

- C (NC) N/A INDEPENDENT SUPPORT: Light fixtures in suspended grid ceilings shall be supported independently of the ceiling suspension system by a minimum of two wires at diagonally opposite corners of the fixtures. (Tier 2: Sec. 4.8.3.1)
- C (NC) N/A EMERGENCY LIGHTING: Emergency lighting shall be anchored or braced to prevent falling or swaying during an earthquake. (Tier 2: Sec. 4.8.3.2)

Cladding and Glazing

- C NC (N/A) CLADDING ANCHORS: Cladding components weighing more than 10 psf shall be anchored to the exterior wall framing at a spacing equal to or less than 6 ft. for Life Safety and 4 ft. for Immediate Occupancy. (Tier 2: Sec. 4.8.4.1)
- C NC (N/A) CLADDING ISOLATION: For moment frame buildings of steel or concrete, panel connections shall be detailed to accommodate a drift ratio of 0.02 for Life Safety and 0.01 for Immediate Occupancy. (Tier 2: Sec. 4.8.4.2)
- C NC (N/A) MULTISTORY PANELS: For multistory panels attached at each floor level, the panels and connections shall be able to accommodate a drift ratio of 0.02 for Life Safety and 0.01 for Immediate Occupancy. (Tier 2: Sec. 4.8.4.3)

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| C | NC | (N/A) | BEARING CONNECTIONS: Where bearing connections are required, there shall be a minimum of two bearing connections for each wall panel. (Tier 2: Sec. 4.8.4.4) |
| C | NC | (N/A) | INSERTS: Where inserts are used in concrete connections, the inserts shall be anchored to reinforcing steel. (Tier 2: Sec. 4.8.4.5) |
| C | NC | (N/A) | PANEL CONNECTIONS: Exterior cladding panels shall be anchored with a minimum of 2 connections for each wall panel for Life Safety and 4 connections for Immediate Occupancy. (Tier 2: Sec. 4.8.4.6) |
| C | NC | (N/A) | DETERIORATION: There shall be no evidence of deterioration or corroding in any of the connection elements. (Tier 2: Sec. 4.8.4.7) |
| C | NC | (N/A) | DAMAGE: There shall be no damage to exterior wall cladding. (Tier 2: Sec. 4.8.4.8) |
| C | NC | (N/A) | GLAZING: Glazing in curtain walls and individual panes over 16 square feet in area, located up to a height of 10 feet above an exterior walking surface, shall be laminated annealed or heat strengthened safety glass that will remain in the frame when cracked. (Tier 2: Sec. 4.8.4.9) |

Masonry Veneer

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| C | NC | (N/A) | SHELF ANGLES: Masonry veneer shall be supported by shelf angles or other elements at each floor above the first floor. (Tier 2: Sec. 4.8.5.1) |
| C | NC | (N/A) | TIES: Masonry veneer shall be connected to the back-up with corrosion-resistant ties. The ties shall have a spacing of equal to or less than 36" for Life Safety and 24" for Immediate Occupancy with a minimum of one tie for every 2-2/3 square feet. (Tier 2: Sec. 4.8.5.2) |
| C | NC | (N/A) | WEAKENED PLANES: Masonry veneer shall be anchored to the back-up at locations of flashing. (Tier 2: Sec. 4.8.5.3) |

Parapets, Cornices, Ornamentation and Appendages

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| C | NC | (N/A) | URM PARAPETS: There shall be no laterally unsupported unreinforced masonry parapets or cornices above the highest anchorage level with height-to-thickness ratios greater than 1.5 in regions of high seismicity and 2.5 in regions of moderate or low seismicity. (Tier 2: Sec. 4.8.8.1) |
| C | NC | (N/A) | CANOPIES: Canopies located at building exits shall be anchored at a spacing 10 feet for Life Safety and 6 feet for Immediate Occupancy. (Tier 2: Sec. 4.8.8.2) |

Masonry Chimneys

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| C | NC | (N/A) | URM: No unreinforced masonry chimney shall extend above the roof surface more than twice the least dimension of the chimney. (Tier 2: Sec. 4.8.9.1) |
| C | NC | (N/A) | MASONRY: Masonry chimneys shall be anchored to the floor and roof. (Tier 2: Sec. 4.8.9.2) |

Stairs

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|-----|----|-------|---|
| C | NC | (N/A) | URM WALLS: Walls around stair enclosures shall not consist of unbraced hollow clay tile or unreinforced masonry. (Tier 2: Sec. 4.8.10.1) |
| (C) | NC | N/A | STAIR DETAILS: In moment frame structures, the connection between the stairs and the structure shall not rely on shallow anchors in concrete. Alternatively, the stair details shall be capable of accommodating the drift calculated using the Quick Check Procedure of Section 3.5.3.1 without inducing tension in the anchors. (Tier 2: Sec. 4.8.10.2) |

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Building Contents and Furnishing

- C (NC) N/A TALL NARROW CONTENTS: Contents with a height-to-depth ratio greater than 3 for Immediate Occupancy and 4 for Life Safety shall be anchored to the floor slab or adjacent walls. (Tier 2: Sec. 4.8.11.1)

Mechanical and Electrical Equipment

- C (NC) N/A EMERGENCY POWER: Equipment used as part of an emergency power system shall be mounted to maintain continued operation after an earthquake. (Tier 2: Sec. 4.8.12.1)
- C (NC) N/A HEAVY EQUIPMENT: Equipment weighing over 20 lb that is attached to ceilings, walls, or other supports 4 ft. above the floor level shall be braced. (Tier 2: Sec. 4.8.12.2)

Piping

- C (NC) N/A FIRE SUPPRESSION PIPING: Fire suppression piping shall be anchored and braced in accordance with *NFPA-13* (NFPA, 1996). This statement need not be evaluated for buildings in regions of moderate seismicity being evaluated to the Life Safety Performance Level. (Tier 2: Sec. 4.8.13.1)
- C (NC) N/A FLEXIBLE COUPLINGS: Fluid, gas and fire suppression piping shall have flexible couplings. This statement need not be evaluated for buildings in regions of moderate seismicity being evaluated to the Life Safety Performance Level. (Tier 2: Sec. 4.8.13.2)

Hazardous Materials Storage and Distribution

- C (NC) N/A TOXIC SUBSTANCES: Toxic and hazardous substances stored in breakable containers shall be restrained from falling by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 4.8.15.1)

3.9.1S Supplemental Nonstructural Component Checklist

This Supplemental Nonstructural Component Checklist shall be completed when required by Table 3-2. The Basic Nonstructural Component Checklist shall be completed prior to completing this Supplemental Nonstructural Component Checklist.

Partitions

- C (NC) N/A DRIFT: The drift ratio for masonry partitions shall be limited to 0.005. (Tier 2: Sec. 4.8.1.2)
- C (NC) N/A STRUCTURAL SEPARATIONS: Partitions at structural separations shall have seismic or control joints. (Tier 2: Sec. 4.8.1.3)
- C (NC) N/A TOPS: The tops of framed or panelized partitions that only extend to the ceiling line shall have lateral bracing to the building structure at a spacing of equal to or less than 6 feet. (Tier 2: Sec. 4.8.1.4)

Ceiling Systems

- C (NC) N/A EDGES: The edges of integrated suspended ceilings shall be separated from enclosing walls by a minimum of 1/2". (Tier 2: Sec. 4.8.2.5)
- C NC (N/A) SEISMIC JOINT: The ceiling system shall not extend continuously across any seismic joint. (Tier 2: Sec. 4.8.2.6)

Light Fixtures

- C NC (N/A) PENDANT SUPPORTS: Light fixtures on pendant supports shall be attached at a spacing of equal to or less than 6 ft. and, if rigidly supported, shall be free to move without damaging adjoining materials. (Tier 2: Sec. 4.8.3.3)
- (C) NC N/A LENS COVERS: Lens covers on fluorescent light fixtures shall be attached or supplied with safety devices. (Tier 2: Sec. 4.8.3.4)

Masonry Veneer

- C NC (N/A) MORTAR: The mortar in masonry veneer shall not be easily scraped away from the joints by hand with a metal tool, and there shall not be significant areas of eroded mortar. (Tier 2: Sec. 4.8.5.4)
- C NC (N/A) WEEP HOLES: Weep holes shall be present and base flashing shall be installed. (Tier 2: Sec. 4.8.5.5)
- C NC (N/A) CORROSION: Corrosion of veneer ties, tie screws, studs, and stud tracks shall be minimal. (Tier 2: Sec. 4.8.5.6)
- C NC (N/A) STONE PANELS: Stone panels less than 2 inches nominal thickness shall be anchored every 2 square feet of area. (Tier 2: Sec. 4.8.5.7)
- C NC (N/A) CRACKS: There shall no be visible cracks or weak veins in the stone. (Tier 2: Sec. 4.8.5.8)

Metal Stud Back-Up Systems

- C (NC) N/A STUD TRACKS: Stud tracks shall be fastened to structural walls or floors at a spacing of equal to or less than 24 inches. (Tier 2: Sec. 4.8.6.1)
- (C) NC N/A OPENINGS: Additional steel studs shall frame window and door openings. (Tier 2: Sec. 4.8.6.2)

Concrete Block and Masonry Back-Up Systems

- C (NC) N/A CONCRETE BLOCK: Concrete block shall qualify as reinforced masonry. (Tier 2: Sec. 4.8.7.1)
- C (NC) N/A BACK-UP: Concrete block back-up shall be anchored to the structural frame at a spacing of equal to or less than 4 feet along the floors and roof. (Tier 2: Sec. 4.8.7.2)
- C (NC) N/A URM BACK-UP: There shall not be any unreinforced masonry back-up. (Tier 2: Sec. 4.8.7.3)

Parapets, Cornices, Ornamentation and Appendages

- C NC (N/A) CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 shall have vertical reinforcement. (Tier 2: Sec. 4.8.8.3)
- (C) NC N/A APPENDAGES: Cornices, parapets, signs, and other appendages that extend above the highest anchorage level or cantilever from exterior wall faces and other exterior wall ornamentation shall be reinforced and anchored to the structural system at a spacing of equal to or less than 10 ft. for Life Safety and 6 ft. for Immediate Occupancy. (Tier 2: Sec. 4.8.8.4)

Building Contents and Furnishing

- C NC (N/A) FILE CABINETS: File cabinets arranged in groups shall be attached to one another. (Tier 2: Sec. 4.8.11.2)
- C NC (N/A) DRAWERS: Cabinet drawers shall have latches to keep them closed during an earthquake. (Tier 2: Sec. 4.8.11.3)
- C NC (N/A) COMPUTER ACCESS FLOORS: Computer access floors shall be braced. (Tier 2: Sec. 4.8.11.4)
- C NC (N/A) ACCESS FLOORS: Equipment supported on access floor systems shall be either attached to the structure or fastened to a laterally braced floor system. (Tier 2: Sec. 4.8.11.5)

Mechanical and Electrical Equipment

- C (NC) N/A HEAVY EQUIPMENT: Equipment weighing over 100 lb. shall be anchored to the structure or foundation. (Tier 2: Sec. 4.8.12.3)
- C (NC) N/A VIBRATION ISOLATORS: Equipment mounted on vibration isolators shall be equipped with restraints or snubbers. (Tier 2: Sec. 4.8.12.4)
- C (NC) N/A ELECTRICAL EQUIPMENT: Electrical equipment shall be attached to the structural system. (Tier 2: Sec. 4.8.12.5)

Piping

- C (NC) N/A FLUID AND GAS PIPING: Fluid and gas piping shall be anchored and braced to the structure in accordance with *SP-58* (MSS, 1993). (Tier 2: Sec. 4.8.13.3)
- (C) NC N/A SHUT-OFF VALVES: Shut-off devices shall be present at building utility interfaces to shut off the flow of gas and high temperature energy in the event of earthquake-induced failure. (Tier 2: Sec. 4.8.13.4)
- C (NC) N/A C-CLAMPS: One-sided C-clamps that support major piping shall not be unrestrained. (Tier 2: Sec. 4.8.13.5)

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Ducts

- C (NC) (N/A) DUCT BRACING: Rectangular ductwork exceeding 6 square feet in cross-sectional area, and round ducts exceeding 28" in diameter shall be braced. Maximum transverse bracing shall not exceed 40 feet for Life Safety and 30 feet for Immediate Occupancy. Maximum longitudinal bracing shall not exceed 80 feet for Life Safety and 60 feet for Immediate Occupancy. Intermediate supports shall not be considered part of the lateral-force-resisting system. (Tier 2: Sec. 4.8.14.1)
- C NC (N/A) STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts shall be braced and shall have flexible connections at seismic joints. (Tier 2: Sec. 4.8.14.2)
- (C) NC (N/A) DUCT SUPPORT: Ducts shall not be supported by piping or other nonstructural elements. (Tier 2: Sec. 4.8.14.3)

Hazardous Materials Storage and Distribution

- C NC (N/A) GAS CYLINDERS: Compressed gas cylinders shall be restrained. (Tier 2: Sec. 4.8.15.2)
- C NC (N/A) HAZARDOUS MATERIALS: Piping containing hazardous materials shall have shut-off valves or other devices to prevent major spills or leaks. (Tier 2: Sec. 4.8.15.3)

Elevators

- C NC (N/A) SUPPORT SYSTEM: All elements of the elevator system shall be anchored. (Tier 2: Sec. 4.8.16.1)
- C NC (N/A) SEISMIC SWITCH: All elevators shall be equipped with seismic switches that will terminate operations when the ground motion exceeds 0.10g. (Tier 2: Sec. 4.8.16.2)
- C NC (N/A) SHAFT WALLS: All elevator shaft walls shall be anchored and reinforced to prevent toppling into the shaft during strong shaking. (Tier 2: Sec. 4.8.16.3)
- C NC (N/A) RETAINER GUARDS: Cable retainer guards on sheaves and drums shall be present to inhibit the displacement of cables. (Tier 2: Sec. 4.8.16.4)
- C NC (N/A) RETAINER PLATE: A retainer plate shall be present at the top and bottom of both car and counterweight. (Tier 2: Sec. 4.8.16.5)
- C NC (N/A) COUNTERWEIGHT RAILS: All counterweight rails shall be sized to current industry standards and shall be larger than eight-pound rails. (Tier 2: Sec. 4.8.16.6)
- C NC (N/A) BRACKETS: The brackets that tie the counterweight rail to the building structure shall be sized to meet industry standards and shall have a spacing of 8 feet or less. (Tier 2: Sec. 4.8.16.7)
- C NC (N/A) SPREADER BRACKET: Spreader brackets shall not be used to resist seismic forces. (Tier 2: Sec. 4.8.16.8)

BUILDING 650, 651 AND 652

3.7.10 Basic Structural Checklist For Building Type C3: Concrete Frames With Infill Masonry Shear Walls And Stiff Diaphragms

This Basic Structural Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Commentary:

This is an older type of building construction that consists of a frame assembly of cast-in-place concrete beams and columns. The floors and roof consist of cast-in-place concrete slabs. Walls consist of infill panels constructed of solid clay brick, concrete block, or hollow clay tile masonry. The seismic performance of this type of construction depends on the interaction between the frame and infill panels. The combined behavior is more like a shear wall structure than a frame structure. Solidly infilled masonry panels form diagonal compression struts between the intersections of the frame members. If the walls are offset from the frame and do not fully engage the frame members, the diagonal compression struts will not develop. The strength of the infill panel is limited by the shear capacity of the masonry bed joint or the compression capacity of the strut. The post-cracking strength is determined by an analysis of a moment frame that is partially restrained by the cracked infill. The shear strength of the concrete columns, after cracking of the infill, may limit the semiductile behavior of the system. The diaphragms consist of concrete floors and are stiff relative to the walls.

Building System

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|-----|----|-------|--|
| (C) | NC | N/A | LOAD PATH: The structure shall contain one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1) |
| C | NC | (N/A) | MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3) |
| C | NC | (N/A) | WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80% of the strength in an adjacent story above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1) |
| C | NC | (N/A) | SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70% of the stiffness in an adjacent story above or below or less than 80% of the average stiffness of the three stories above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2) |
| (C) | NC | N/A | GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30% in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses. (Tier 2: Sec. 4.3.2.3) |

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- (C) NC N/A VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
- (C) NC N/A MASS: There shall be no change in effective mass more than 50% from one story to the next for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.5)
- (C) NC N/A TORSION: The distance between the story center of mass and the story center of rigidity shall be less than 20% of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)
- C (NC) N/A DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)
- (C) NC N/A MASONRY UNITS: There shall be no visible deterioration of masonry units. (Tier 2: Sec. 4.3.3.7)
- (C) NC N/A MASONRY JOINTS: The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no areas of eroded mortar. (Tier 2: Sec. 4.3.3.8)
- (C) NC N/A CRACKS IN INFILL WALLS: There shall be no existing diagonal cracks in infill walls that extend throughout a panel, are greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy, or have out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.12)
- (C) NC N/A CRACKS IN BOUNDARY COLUMNS: There shall be no existing diagonal cracks wider than 1/8" for Life Safety and 1/16" for Immediate Occupancy in concrete columns that encase masonry infills. (Tier 2: Sec. 4.3.3.13)

Lateral Force Resisting System

- (C) NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)
- C NC (N/A) SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 50 psi for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.4.1)
- C (NC) N/A SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 15 psi for clay units and 30 psi for concrete units for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.5.1)
- C (NC) N/A WALL CONNECTIONS: All infill walls shall have a positive connection to the frame to resist out-of-plane forces for Life Safety and the connection shall be able to develop the out-of-plane strength of the wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.6.1)

Connections

- C (NC) N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be reinforced and connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the shear strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)
- (C) NC N/A CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)

3.7.10S Supplemental Structural Checklist For Building Type C3: Concrete Frames With Infill Masonry Shear Walls And Stiff Diaphragms

This Supplemental Structural Checklist shall be completed when required by Table 3-2. The Basic Structural Checklist shall be completed prior to completing this Supplemental Structural Checklist.

Lateral Force Resisting System

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|---|----|-----|--|
| C | NC | N/A | DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the elements for Life Safety and shall have ductile detailing for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2) |
| C | NC | N/A | FLAT SLABS: Flat slabs/plates classified as secondary components shall have continuous bottom steel through the column joints for Life Safety. Flat slabs/plates shall not be permitted for the Immediate Occupancy Performance Level. (Tier 2: Sec. 4.4.1.6.3) |
| C | NC | N/A | REINFORCING AT OPENINGS: All wall openings that interrupt rebar shall have trim reinforcing on all sides. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.3) |
| C | NC | N/A | PROPORTIONS: The height-to-thickness ratio of the infill walls at each story shall be less than 9 for Life Safety in regions of high seismicity, 13 for Immediate Occupancy in regions of moderate seismicity, and 8 for Immediate Occupancy in regions of high seismicity. (Tier 2: Sec. 4.4.2.6.2) |
| C | NC | N/A | SOLID WALLS: The infill walls shall not be of cavity construction. (Tier 2: Sec. 4.4.2.6.3) |
| C | NC | N/A | INFILL WALLS: The infill walls shall be continuous to the soffits of the frame beams. (Tier 2: Sec. 4.4.2.6.4) |

Diaphragms

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|---|----|-----|---|
| C | NC | N/A | DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors. In wood buildings, the diaphragms shall not have expansion joints. (Tier 2: Sec. 4.5.1.1) |
| C | NC | N/A | OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25% of the wall length for Life Safety and 15% of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4) |
| C | NC | N/A | PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7) |
| C | NC | N/A | DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragm openings larger than 50% of the building width in either major or plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8) |

Connections

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|---|----|-----|---|
| C | NC | N/A | LATERAL LOAD AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10) |
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3.7.16 General Basic Structural Checklist

This General Basic Structural Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

BUILDING SYSTEM

General

- (C) NC N/A LOAD PATH: The structure shall contain one complete load path for Life Safety and Immediate Occupancy for seismic force effects from any horizontal direction that serves to transfer the inertial forces from the mass to the foundation. (Tier 2: Sec. 4.3.1.1)
- (C) NC N/A ADJACENT BUILDINGS: An adjacent building shall not be located next to the structure being evaluated closer than 4% of the height for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.1.2)
- C NC (N/A) MEZZANINES: Interior mezzanine levels shall be braced independently from the main structure, or shall be anchored to the lateral-force-resisting elements of the main structure. (Tier 2: Sec. 4.3.1.3)

Configuration

- C NC (N/A) WEAK STORY: The strength of the lateral-force-resisting system in any story shall not be less than 80% of the strength in an adjacent story above, or below, for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.1)
- C NC (N/A) SOFT STORY: The stiffness of the lateral-force-resisting system in any story shall not be less than 70% of the stiffness in an adjacent story above or below or less than 80% of the average stiffness of the three stories above or below for Life-Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.2)
- (C) NC N/A GEOMETRY: There shall be no changes in horizontal dimension of the lateral-force-resisting system of more than 30% in a story relative to adjacent stories for Life Safety and Immediate Occupancy, excluding one-story penthouses. (Tier 2: Sec. 4.3.2.3)
- (C) NC N/A VERTICAL DISCONTINUITIES: All vertical elements in the lateral-force-resisting system shall be continuous to the foundation. (Tier 2: Sec. 4.3.2.4)
- (C) NC N/A MASS: There shall be no change in effective mass more than 50% from one story to the next for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.5)
- (C) NC N/A TORSION: The distance between the story center of mass and the story center of rigidity shall be less than 20% of the building width in either plan dimension for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.3.2.6)

Condition of Materials

- C NC (N/A) DETERIORATION OF WOOD: There shall be no signs of decay, shrinkage, splitting, fire damage, or sagging in any of the wood members and none of the metal accessories shall be deteriorated, broken, or loose. (Tier 2: Sec. 4.3.3.1)
- C NC (N/A) OVERDRIVEN FASTENERS: There shall be no evidence of overdriven fasteners in the shear walls. (Tier 2: Sec. 4.3.3.2)
- C (NC) N/A DETERIORATION OF STEEL: There shall be no visible rusting, corrosion, cracking or other deterioration in any of the steel elements or connections in the vertical- or lateral-force-resisting systems. (Tier 2: Sec. 4.3.3.3)
- C (NC) N/A DETERIORATION OF CONCRETE: There shall be no visible deterioration of concrete or reinforcing steel in any of the vertical- or lateral-force-resisting elements. (Tier 2: Sec. 4.3.3.4)
- C NC (N/A) POST-TENSIONING ANCHORS: There shall be no evidence of corrosion or spalling in the vicinity of post-tensioning or end fittings. Coil anchors shall not have been used. (Tier 2: Sec. 4.3.3.5)
- C NC (N/A) PRECAST CONCRETE WALLS: There shall be no visible deterioration of concrete or reinforcing steel or evidence of distress, especially at the connections. (Tier 2: Sec. 4.3.3.6)
- (C) NC N/A MASONRY UNITS: There shall be no visible deterioration of masonry units. (Tier 2: Sec. 4.3.3.7)
- (C) NC N/A MASONRY JOINTS: The mortar shall not be easily scraped away from the joints by hand with a metal tool, and there shall be no areas of eroded mortar. (Tier 2: Sec. 4.3.3.8)
- C NC (N/A) CONCRETE WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8" for Life Safety and 1/16" for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.9)
- C NC (N/A) REINFORCED MASONRY WALL CRACKS: All existing diagonal cracks in wall elements shall be less than 1/8" for Life Safety and 1/16" for Immediate Occupancy, shall not be concentrated in one location, and shall not form an X pattern. (Tier 2: Sec. 4.3.3.10)
- (C) NC N/A UNREINFORCED MASONRY WALL CRACKS: There shall be no existing diagonal cracks in wall elements greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy or out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.11)
- (C) NC N/A CRACKS IN INFILL WALLS: There shall be no existing diagonal cracks in infill walls that extend throughout a panel, are greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy, or have out-of-plane offsets in the bed joint greater than 1/8" for Life Safety and 1/16" for Immediate Occupancy. (Tier 2: Sec. 4.3.3.12)
- C (NC) N/A CRACKS IN BOUNDARY COLUMNS: There shall be no existing diagonal cracks wider than 1/8" for Life Safety and 1/16" for Immediate Occupancy in concrete columns that encase masonry infills. (Tier 2: Sec. 4.3.3.13)

LATERAL FORCE RESISTING SYSTEM

Moment Frames

General

- (C) NC N/A REDUNDANCY: The number of lines of moment frames in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. The number of bays of moment frames in each line shall be greater than or equal to 2 for Life Safety and 3 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.1.1)

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Moment Frames with Infill Walls

- C (NC) N/A INTERFERING WALLS: All infill walls placed in moment frames shall be isolated from structural elements. (Tier 2: Sec. 4.4.1.2.1)

Steel Moment Frames

- C NC (N/A) DRIFT CHECK: The drift ratio of the steel moment frames, calculated using the Quick Check procedure of Section 3.5.3.1, shall be less than 0.025 for Life Safety and 0.015 for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.1)
- C NC (N/A) AXIAL STRESS CHECK: The axial stress due to gravity loads in columns subjected to overturning forces shall be less than $0.10F_y$ for Life Safety and Immediate Occupancy. Alternatively, the axial stress due to overturning forces alone, calculated using the Quick Check Procedure of Section 3.5.3.6, shall be less than $0.30F_y$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.2)

Concrete Moment Frames

- C (NC) N/A SHEAR STRESS CHECK: The shear stress in the concrete columns, calculated using the Quick Check procedure of Section 3.5.3.2, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.1)
- C (NC) N/A AXIAL STRESS CHECK: The axial stress due to gravity loads in columns subjected to overturning forces shall be less than $0.10f'_c$ for Life Safety and Immediate Occupancy. Alternatively, the axial stresses due to overturning forces alone, calculated using the Quick Check Procedure of Section 3.5.3.6, shall be less than $0.30f'_c$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.2)

Precast Concrete Moment Frames

- C NC (N/A) PRECAST CONNECTION CHECK: The precast connections at frame joints shall have the capacity to resist the shear and moment demands calculated using the Quick Procedure of Section 3.5.3.5. (Tier 2: Sec. 4.4.1.5.1)

Frames Not Part of the Lateral-Force-Resisting System

- (C) NC N/A COMPLETE FRAMES: Steel or concrete frames classified as secondary components shall form a complete vertical load carrying system. (Tier 2: Sec. 4.4.1.6.1)

Shear Walls

General

- (C) NC N/A REDUNDANCY: The number of lines of shear walls in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.1.1)

Concrete Shear Walls

- C NC (N/A) SHEAR STRESS CHECK: The shear stress in the concrete shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.1)

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C NC (N/A) REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be greater than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.2)

C NC (N/A) COLUMN SPLICES: Steel columns encased in shear wall boundary elements shall have splices that develop the tensile strength of the column. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.9)

Precast Concrete Shear Walls

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the precast panels, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 100 psi or $2\sqrt{f'_c}$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.3.1)

C NC (N/A) REINFORCING STEEL: The ratio of reinforcing steel area to gross concrete area shall be greater than 0.0015 in the vertical direction and 0.0025 in the horizontal direction for Life Safety and Immediate Occupancy. The spacing of reinforcing steel shall be equal to or less than 18" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.3.2)

Reinforced Masonry Shear Walls

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the reinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 50 psi for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.4.1)

C NC (N/A) REINFORCING STEEL: The total vertical and horizontal reinforcing steel ratio in reinforced masonry walls shall be greater than 0.002 for Life Safety and 0.003 for Immediate Occupancy of the wall with the minimum of 0.0007 for Life Safety and 0.001 for Immediate Occupancy in either of the two directions; the spacing of reinforcing steel shall be less than 48" for Life Safety and 24" for Immediate Occupancy; and all vertical bars shall extend to the top of the walls. (Tier 2: Sec. 4.4.2.4.2)

Unreinforced Masonry Shear Walls

C (NC) N/A SHEAR STRESS CHECK: The shear stress in the unreinforced masonry shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than 15 psi for clay units and 30 psi for concrete units for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.2.5.1)

Infill Walls in Frames

C (NC) N/A WALL CONNECTIONS: All infill walls shall have a positive connection to the frame to resist out-of-plane forces for Life Safety and the connection shall be able to develop the out-of-plane strength of the wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.6.1)

Walls in Wood-Frame Buildings

C NC (N/A) SHEAR STRESS CHECK: The shear stress in the shear walls, calculated using the Quick Check procedure of Section 3.5.3.3, shall be less than the following values for Life Safety and Immediate Occupancy (Tier 2: Sec. 4.4.2.7.1):

Structural panel sheathing:	1000 plf
Diagonal sheathing:	700 plf
Straight sheathing:	80 plf
All other conditions:	100 plf

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|---|----|-------|---|
| C | NC | (N/A) | STUCCO (EXTERIOR PLASTER) SHEAR WALLS: Multistory buildings shall not rely on exterior stucco walls as the primary lateral-force-resisting system. (Tier 2: Sec. 4.4.2.7.2) |
| C | NC | (N/A) | GYPSUM WALLBOARD OR PLASTER SHEAR WALLS: Interior plaster or gypsum wallboard shall not be used as shear walls on buildings over one story in height. (Tier 2: Sec. 4.4.2.7.3) |
| C | NC | (N/A) | NARROW WOOD SHEAR WALLS: Narrow wood shear walls with an aspect ratio greater than 2 to 1 for Life Safety and 1.5 to 1 for Immediate Occupancy shall not be used to resist lateral forces developed in the building. (Tier 2: Sec. 4.4.2.7.4) |
| C | NC | (N/A) | WALLS CONNECTED THROUGH FLOORS: Shear walls shall have interconnection between stories to transfer overturning and shear forces through the floor. (Tier 2: Sec. 4.4.2.7.5) |
| C | NC | (N/A) | HILLSIDE SITE: For a sloping site greater than one-half story, all shear walls on the downhill slope shall have an aspect ratio less than 1 to 1 for Life-Safety and 1 to 2 for Immediate Occupancy. (Tier 2: Sec. 4.4.2.7.6) |
| C | NC | (N/A) | CRIPPLE WALLS: All cripple walls below first floor level shear walls shall be braced to the foundation with shear elements. (Tier 2: Sec. 4.4.2.7.7) |

Braced Frames

General

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|---|----|-------|--|
| C | NC | (N/A) | REDUNDANCY: The number of lines of braced frames in each principal direction shall be greater than or equal to 2 for Life Safety and Immediate Occupancy. The number of braced bays in each line shall be greater than 2 for Life Safety and 3 for Immediate Occupancy. (Tier 2: Sec. 4.4.3.1.1) |
| C | NC | (N/A) | AXIAL STRESS CHECK: The axial stress in the diagonals, calculated using the Quick Check procedure of Section 3.5.3.4, shall be less than 18 ksi or $0.50F_y$ for Life Safety and for Immediate Occupancy. (Tier 2: Sec. 4.4.3.1.2) |
| C | NC | (N/A) | COLUMN SPLICES: All column splice details located in braced frames shall develop the tensile strength of the column. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.5) |

DIAPHRAGMS

Precast Concrete Diaphragms

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| C | NC | (N/A) | TOPPING SLAB: Precast concrete diaphragm elements shall be interconnected by a continuous reinforced concrete topping slab. (Tier 2: Sec. 4.5.5.1) |
|---|----|-------|--|

CONNECTIONS

Anchorage for Normal Forces

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|---|------|-----|---|
| C | (NC) | N/A | WALL ANCHORAGE: Exterior concrete or masonry walls shall be anchored for out-of-plane forces at each diaphragm level with steel anchors or straps that are developed into the diaphragm. (Tier 2: Sec. 4.6.1.1) |
|---|------|-----|---|

Shear Transfer

- C (NC) N/A TRANSFER TO SHEAR WALLS: Diaphragms shall be reinforced and connected for transfer of loads to the shear walls for Life Safety and the connections shall be able to develop the shear strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.2.1)
- C NC (N/A) TRANSFER TO STEEL FRAMES: Diaphragms shall be connected for transfer of loads to the steel frames for Life Safety and the connections shall be able to develop the shear strength of the frames for Immediate Occupancy. (Tier 2: Sec. 4.6.2.2)
- C NC (N/A) TOPPING SLAB TO WALLS OR FRAMES: Reinforced concrete topping slabs that interconnect the precast concrete diaphragm elements shall be doweled into the shear wall or frame elements for Life Safety and the dowels shall be able to develop the shear strength of the walls or frames for Immediate Occupancy. (Tier 2: Sec. 4.6.2.3)

Vertical Components

- C NC (N/A) STEEL COLUMNS: The columns in lateral-force-resisting frames shall be anchored to the building foundation for Life Safety and the anchorage shall be able to develop the tensile capacity of the foundation for Immediate Occupancy. (Tier 2: Sec. 4.6.3.1)
- (C) NC N/A CONCRETE COLUMNS: All concrete columns shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.2)
- C NC (N/A) WOOD POSTS: There shall be a positive connection of wood posts to the foundation. (Tier 2: Sec. 4.6.3.3)
- C NC (N/A) WOOD SILLS: All wood sills shall be bolted to the foundation. (Tier 2: Sec. 4.6.3.4)
- C (NC) N/A WALL REINFORCING: Walls shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.3.5)
- (C) NC N/A SHEAR-WALL-BOUNDARY COLUMNS: The shear wall boundary columns shall be anchored to the building foundation for Life Safety and the anchorage shall be able to develop the tensile capacity of the column for Immediate Occupancy. (Tier 2: Sec. 4.6.3.6)
- C NC (N/A) PRECAST WALL PANELS: Precast wall panels shall be doweled into the foundation for Life Safety and the dowels shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.6.3.7)
- C (NC) N/A WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the foundation for Life Safety and the attachment shall be able to develop the shear capacity of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.3.8)

Interconnection of Elements

- (C) NC N/A GIRDER/COLUMN CONNECTION: There shall be a positive connection between the girder and the column support. (Tier 2: Sec. 4.6.4.1)

Panel Connections

- C (NC) N/A ROOF PANELS: Metal, plastic, or cementitious roof panels shall be positively attached to the roof framing to resist seismic forces for Life Safety and the attachment shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.5.1)
- C (NC) N/A WALL PANELS: Metal, fiberglass or cementitious wall panels shall be positively attached to the framing to resist seismic forces for Life Safety and the attachment shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.5.2)

3.7.16S General Supplemental Structural Checklist

This General Supplemental Structural Checklist shall be completed when required by Table 3-2. The General Basic Structural Checklist shall be completed prior to completing this General Supplemental Structural Checklist.

LATERAL FORCE RESISTING SYSTEM

Moment Frames

Steel Moment Frames

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|---|----|-------|--|
| C | NC | (N/A) | MOMENT-RESISTING CONNECTIONS: All moment connections shall be able to develop the strength of the adjoining members or panel zones. (Tier 2: Sec. 4.4.1.3.3) |
| C | NC | (N/A) | PANEL ZONES: All panel zones shall have the shear capacity to resist the shear demand required to develop $0.8\Sigma M_p$ of the girders framing in at the face of the column. (Tier 2: Sec. 4.4.1.3.4) |
| C | NC | (N/A) | COLUMN SPLICES: All column splice details located in moment resisting frames shall include connection of both flanges and the web for Life Safety and the splice shall develop the strength of the column for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.5) |
| C | NC | (N/A) | STRONG COLUMN/WEAK BEAM: The percent of strong column/weak beam joints in each story of each line of moment resisting frames shall be greater than 50% for Life Safety and 75% for Immediate Occupancy. (Tier 2: Sec. 4.4.1.3.6) |
| C | NC | (N/A) | COMPACT MEMBERS: All moment frame elements shall meet compact section requirements set forth by the <i>Load and Resistance Factor Design Specification for Structural Steel Buildings</i> (AISC, 1993). This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.7) |
| C | NC | (N/A) | BEAM PENETRATIONS: All openings in frame-beam webs shall be less than 1/4 of the beam depth and shall be located in the center half of the beams. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.8) |
| C | NC | (N/A) | GIRDER FLANGE CONTINUITY PLATES: There shall be girder flange continuity plates at all moment-resisting frame joints. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.9) |
| C | NC | (N/A) | OUT-OF-PLANE BRACING: Beam-column joints shall be braced out-of-plane. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.10) |
| C | NC | (N/A) | BOTTOM FLANGE BRACING: The bottom flange of beams shall be braced out-of-plane. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.3.11) |

Concrete Moment Frames

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|---|----|-------|---|
| C | NC | (N/A) | FLAT SLAB FRAMES: The lateral-force-resisting system shall not be a frame consisting of columns and a flat slab/plate without beams. (Tier 2: Sec. 4.4.1.4.3) |
| C | NC | (N/A) | PRESTRESSED FRAME ELEMENTS: The lateral-load-resisting frames shall not include any prestressed or post-tensioned elements. (Tier 2: Sec. 4.4.1.4.4) |
| C | NC | (N/A) | SHORT CAPTIVE COLUMNS: There shall be no columns at a level with height/depth ratios less than 50% of the nominal height/depth ratio of the typical columns at that level for Life Safety and 75% for Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.5) |

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| C | (NC) | N/A | NO SHEAR FAILURES: The shear capacity of frame members shall be able to develop the moment capacity at the top and bottom of the columns. (Tier 2: Sec. 4.4.1.4.6) |
| C | (NC) | N/A | STRONG COLUMN/WEAK BEAM: The sum of the moment capacity of the columns shall be 20% greater than that of the beams at frame joints. (Tier 2: Sec. 4.4.1.4.7) |
| (C) | NC | N/A | BEAM BARS: At least two longitudinal top and two longitudinal bottom bars shall extend continuously throughout the length of each frame beam. At least 25% of the longitudinal bars provided at the joints for either positive or negative moment shall be continuous throughout the length of the members for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.8) |
| C | (NC) | N/A | COLUMN-BAR SPLICES: All column bar lap splice lengths shall be greater than $35 d_b$ for Life Safety and $50 d_b$ for Immediate Occupancy and shall be enclosed by ties spaced at or less than $8 d_b$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.9) |
| (C) | NC | N/A | BEAM-BAR SPLICES: The lap splices for longitudinal beam reinforcing shall not be located within $l_d/4$ of the joints and shall not be located within the vicinity of potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.10) |
| C | (NC) | N/A | COLUMN-TIE SPACING: Frame columns shall have ties spaced at or less than $d/4$ for Life Safety and Immediate Occupancy throughout their length and at or less than $8 d_b$ for Life Safety and Immediate Occupancy at all potential plastic hinge locations. (Tier 2: Sec. 4.4.1.4.11) |
| C | (NC) | N/A | STIRRUP SPACING: All beams shall have stirrups spaced at or less than $d/2$ for Life Safety and Immediate Occupancy throughout their length. At potential plastic hinge locations stirrups shall be spaced at or less than the minimum of $8 d_b$ or $d/4$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.12) |
| C | (NC) | N/A | JOINT REINFORCING: Beam-column joints shall have ties spaced at or less than $8 d_b$ for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.4.1.4.13) |
| (C) | NC | N/A | JOINT ECCENTRICITY: There shall be no eccentricities larger than 20% of the smallest column plan dimension between girder and column centerlines. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.14) |
| C | (NC) | N/A | STIRRUP AND TIE HOOKS: The beam stirrups and column ties shall be anchored into the member cores with hooks of 135° or more. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.1.4.15) |

Precast Concrete Moment Frames

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|---|----|-------|--|
| C | NC | (N/A) | PRECAST FRAMES: For buildings with concrete shear walls, lateral forces shall not be resisted by precast concrete frame elements. (Tier 2: Sec. 4.4.1.5.2) |
| C | NC | (N/A) | PRECAST CONNECTIONS: For buildings with concrete shear walls, the connection between precast frame elements such as chords, ties, and collectors in the lateral-force-resisting system shall develop the capacity of the connected members. (Tier 2: Sec. 4.4.1.5.3) |

Frames Not Part of the Lateral-Force-Resisting System

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|---|------|-------|---|
| C | (NC) | N/A | DEFLECTION COMPATIBILITY: Secondary components shall have the shear capacity to develop the flexural strength of the elements for Life Safety and shall have ductile detailing for Immediate Occupancy. (Tier 2: Sec. 4.4.1.6.2) |
| C | NC | (N/A) | FLAT SLABS: Flat slabs/plates classified as secondary components shall have continuous bottom steel through the column joints for Life Safety. Flat slabs/plates shall not be permitted for the Immediate Occupancy Performance Level. (Tier 2: Sec. 4.4.1.6.3) |

Shear Walls

Concrete Shear Walls

- C NC (N/A) COUPLING BEAMS: The stirrups in all coupling beams over means of egress shall be spaced at or less than $d/2$ and shall be anchored into the core with hooks of 135° or more for Life Safety and Immediate Occupancy. In addition, the beams have the capacity in shear to develop the uplift capacity of the adjacent wall for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.3)
- C NC (N/A) OVERTURNING: All shear walls shall have aspect ratios less than 4 to 1. Wall piers need not be considered. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.4)
- C NC (N/A) CONFINEMENT REINFORCING: For shear walls with aspect ratios greater than 2.0, the boundary elements shall be confined with spirals or ties with spacing less than $8 d_b$. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.5)
- C NC (N/A) REINFORCING AT OPENINGS: There shall be added trim reinforcement around all wall openings. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.6)
- C NC (N/A) WALL THICKNESS: Thickness of bearing walls shall not be less than 1/25 the minimum unsupported height or length, nor less than 4". This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.2.7)
- C NC (N/A) WALL CONNECTIONS: There shall be a positive connection between the shear walls and the steel beams and columns for Life Safety and the connection shall be able to develop the strength of the walls for Immediate Occupancy. (Tier 2: Sec. 4.4.2.2.8)

Precast Concrete Shear Walls

- C NC (N/A) WALL OPENINGS: Openings shall constitute less than 75% of the length of any perimeter wall for Life Safety and 50% for Immediate Occupancy with the wall piers having aspect ratios of less than 2. (Tier 2: Sec. 4.4.2.3.3)
- C NC (N/A) CORNER OPENINGS: Walls with openings at a building corner larger than the width of a typical panel shall be connected to the remainder of the wall with collector reinforcing. (Tier 2: Sec. 4.4.2.3.4)
- C NC (N/A) PANEL-TO-PANEL CONNECTIONS: Adjacent wall panels shall be interconnected to transfer overturning forces between panels by methods other than welded steel inserts. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.3.5)
- C NC (N/A) WALL THICKNESS: Thickness of bearing walls shall not be less than 1/25 the minimum unsupported height or length, nor less than 4". This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.3.6)

Reinforced Masonry Shear Walls

- C NC (N/A) REINFORCING AT OPENINGS: All wall openings that interrupt rebar shall have trim reinforcing on all sides. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.3)
- C NC (N/A) PROPORTIONS: The height-to-thickness ratio of the shear walls at each story shall be less than 30. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.2.4.4)

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Unreinforced Masonry Shear Walls

- C NC (N/A) PROPORTIONS: The height-to-thickness ratio of the shear walls at each story shall be less than the following for Life Safety and Immediate Occupancy (Tier 2: Sec. 4.4.2.5.2):
- | | |
|--------------------------------------|----|
| Top story of multi-story building: | 9 |
| First story of multi-story building: | 15 |
| All other conditions: | 13 |
- C NC (N/A) MASONRY LAY-UP: Filled collar joints of multiwythe masonry walls shall have negligible voids. (Tier 2: Sec. 4.4.2.5.3)

Infill Walls in Frames

- C (NC) N/A PROPORTIONS: The height-to-thickness ratio of the infill walls at each story shall be less than 9 for Life Safety in regions of high seismicity, 13 for Immediate Occupancy in regions of moderate seismicity, and 8 for Immediate Occupancy in regions of high seismicity. (Tier 2: Sec. 4.4.2.6.2)
- C NC (N/A) SOLID WALLS: The infill walls shall not be of cavity construction. (Tier 2: Sec. 4.4.2.6.3)
- C (NC) N/A INFILL WALLS: The infill walls shall be continuous to the soffits of the frame beams. (Tier 2: Sec. 4.4.2.6.4)

Walls in Wood-Frame Buildings

- C NC (N/A) OPENINGS: Walls with garage doors or other large openings shall be braced with plywood shear walls or shall be supported by adjacent construction through substantial positive ties. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec 4.4.2.7.8)
- C NC (N/A) HOLD-DOWN ANCHORS: All walls shall have properly constructed hold-down anchors. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec 4.4.2.7.9)

Braced Frames

General

- C NC (N/A) STIFFNESS OF DIAGONALS: All diagonal elements required to carry compression shall have Kl/r ratios less than 120. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.3)
- C NC (N/A) CONNECTION STRENGTH: All the brace connections shall develop the yield capacity of the diagonals. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.4)
- C NC (N/A) OUT-OF-PLANE BRACING: Braced frame connections attached to beam bottom flanges located away from beam-column joints shall be braced out-of-plane at the bottom flange of the beams. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.1.6)

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Concentrically Braced Frames

- C NC (N/A) K-BRACING: The bracing system shall not include K-braced bays. (Tier 2: Sec. 4.4.3.2.1)
- C NC (N/A) TENSION-ONLY BRACES: Tension-only braces shall not comprise more than 70% of the total lateral-force-resisting capacity in structures over two stories in height. (Tier 2: Sec. 4.4.3.2.2)
- C NC (N/A) CHEVRON BRACING: The bracing system shall not include chevron, or V-braced bays. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.2.3)
- C NC (N/A) CONCENTRIC JOINTS: All the diagonal braces shall frame into the beam-column joints concentrically. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.4.3.2.4)

DIAPHRAGMS

General

- (C) NC N/A DIAPHRAGM CONTINUITY: The diaphragms shall not be composed of split-level floors. In wood buildings, the diaphragms shall not have expansion joints. (Tier 2: Sec. 4.5.1.1)
- (C) NC N/A CROSS TIES: There shall be continuous cross ties between diaphragm chords. (Tier 2: Sec. 4.5.1.2)
- (C) NC N/A ROOF CHORD CONTINUITY: All chord elements shall be continuous, regardless of changes in roof elevation. (Tier 2: Sec. 4.5.1.3)
- (C) NC N/A OPENINGS AT SHEAR WALLS: Diaphragm openings immediately adjacent to the shear walls shall be less than 25% of the wall length for Life Safety and 15% of the wall length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.4)
- C NC (N/A) OPENINGS AT BRACED FRAMES: Diaphragm openings immediately adjacent to the braced frames shall extend less than 25% of the frame length for Life Safety and 15% of the frame length for Immediate Occupancy. (Tier 2: Sec. 4.5.1.5)
- (C) NC N/A OPENINGS AT EXTERIOR MASONRY SHEAR WALLS: Diaphragm openings immediately adjacent to exterior masonry shear walls shall not be greater than 8 feet long for Life Safety and 4 ft. long for Immediate Occupancy. (Tier 2: Sec. 4.5.1.6)
- (C) NC N/A PLAN IRREGULARITIES: There shall be tensile capacity to develop the strength of the diaphragm at re-entrant corners or other locations of plan irregularities. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.7)
- C (NC) N/A DIAPHRAGM REINFORCEMENT AT OPENINGS: There shall be reinforcing around all diaphragms openings larger than 50% of the building width in either major plan dimension. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.1.8)

Wood Diaphragms

- C NC (N/A) STRAIGHT SHEATHING: All straight sheathed diaphragms shall have aspect ratios less than 2 to 1 for Life Safety and 1 to 1 for Immediate Occupancy in the direction being considered. (Tier 2: Sec. 4.5.2.1)
- C NC (N/A) SPANS: All wood diaphragms with spans greater than 24 ft. for Life Safety and 12 ft. for Immediate Occupancy shall consist of wood structural panels or diagonal sheathing. Wood commercial and industrial buildings may have rod-braced systems. (Tier 2: Sec. 4.5.2.2)

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C NC (N/A) UNBLOCKED DIAPHRAGMS: All unblocked wood structural panel diaphragms shall have horizontal spans less than 40 ft. for Life Safety and 25 ft. for Immediate Occupancy and shall have aspect ratios less than or equal to 4 to 1 for Life Safety and 3 to 1 for Immediate Occupancy. (Tier 2: Sec. 4.5.2.3)

C NC (N/A) ASPECT RATIO: All wood diaphragms with an aspect ratio greater than 3 to 1 for Life Safety and 2 to 1 for Immediate Occupancy shall have nonstructural walls connected to all diaphragm levels at a spacing less than 40 ft. for Life Safety and 25 ft. for Immediate Occupancy. (Tier 2: Sec. 4.5.2.4)

Metal Deck Diaphragms

C NC (N/A) NON-CONCRETE DIAPHRAGMS: Untopped metal deck diaphragms or metal deck diaphragms with fill other than concrete shall consist of horizontal spans of less than 40 ft. and shall have aspect ratios less than 4 to 1. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.5.3.1)

Other Diaphragms

C NC (N/A) OTHER DIAPHRAGMS: The diaphragm shall not consist of a system other than those described in Section 4.5. (Tier 2: Sec. 4.5.7.1)

CONNECTIONS

Anchorage for Normal Forces

C NC (N/A) WOOD LEDGERS: The connection between the wall panels and the diaphragm shall not induce cross-grain bending or tension in the wood ledgers. (Tier 2: Sec. 4.6.1.2)

C (NC) (N/A) ANCHOR SPACING: Exterior masonry walls shall be anchored to the floor and roof systems at a spacing of 4 ft. or less for Life Safety and 3 ft. or less for Immediate Occupancy. (Tier 2: Sec. 4.6.1.3)

C NC (N/A) PRECAST PANEL CONNECTIONS: There shall be at least two anchors from each precast wall panel into the diaphragm elements for Life Safety and the anchors shall be able to develop the strength of the panels for Immediate Occupancy. (Tier 2: Sec. 4.6.1.4)

C NC (N/A) STIFFNESS OF WALL ANCHORS: Anchors of concrete or masonry walls to wood structural elements shall be installed taut and shall be stiff enough to prevent movement between the wall and the diaphragm. If bolts are present, the size of the bolt holes in both the connector and framing shall be a maximum of 1/16" larger than the bolt diameter. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.6.1.5)

Vertical Components

C NC (N/A) WOOD SILL BOLTS: Sill bolts shall be spaced at 6 ft. or less for Life Safety and 4 ft. or less for Immediate Occupancy, with proper edge distance provided for wood and concrete. (Tier 2: Sec. 4.6.3.9)

C NC (N/A) LATERAL LOAD AT PILE CAPS: Pile caps shall have top reinforcement and piles shall be anchored to the pile caps for Life Safety, and the pile cap reinforcement and pile anchorage shall be able to develop the tensile capacity of the piles for Immediate Occupancy. (Tier 2: Sec. 4.6.3.10)

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Interconnection of Elements

- C NC (N/A) GIRDERS: Girders supported by walls or pilasters shall have at least two additional ties to secure the anchor bolts for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.6.4.2)
- C NC (N/A) CORBEL BEARING: If the frame girders bear on column corbels, the length of bearing shall be greater than 3" for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.6.4.3)
- C NC (N/A) CORBEL CONNECTIONS: The frame girders shall not be connected to corbels with welded elements. (Tier 2: Sec. 4.6.4.4)

Panel Connections

- C NC (N/A) ROOF PANEL CONNECTIONS: Roof panel connections shall be spaced at or less than 12" for Life Safety and 8" for Immediate Occupancy. (Tier 2: Sec. 4.6.5.3)

3.8 Geologic Site Hazards And Foundations Checklist

This Geologic Site Hazards and Foundations Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Geologic Site Hazards

The following statements shall be completed for buildings in regions of high or moderate seismicity.

- (C) NC N/A LIQUEFACTION: Liquefaction susceptible, saturated, loose granular soils that could jeopardize the building's seismic performance shall not exist in the foundation soils at depths within 50 feet under the building for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.1.1)
- C NC (N/A) SLOPE FAILURE: The building site shall be sufficiently remote from potential earthquake-induced slope failures or rockfalls to be unaffected by such failures or shall be capable of accommodating any predicted movements without failure. (Tier 2: Sec. 4.7.1.2)
- (C) NC N/A SURFACE FAULT RUPTURE: Surface fault rupture and surface displacement at the building site is not anticipated. (Tier 2: Sec. 4.7.1.3)

Condition of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

- (C) NC N/A FOUNDATION PERFORMANCE: There shall be no evidence of excessive foundation movement such as settlement or heave that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.1)

The following statement shall be completed for buildings in regions of high or moderate seismicity being evaluated to the Immediate Occupancy Performance Level.

- (C) NC N/A DETERIORATION: There shall not be evidence that foundation elements have deteriorated due to corrosion, sulfate attack, material breakdown, or other reasons in a manner that would affect the integrity or strength of the structure. (Tier 2: Sec. 4.7.2.2)

Capacity of Foundations

The following statement shall be completed for all Tier 1 building evaluations.

- C NC (N/A) POLE FOUNDATIONS: Pole foundations shall have a minimum embedment depth of 4 ft. for Life Safety and Immediate Occupancy. (Tier 2: Sec. 4.7.3.1)

The following statements shall be completed for buildings in regions of high seismicity and for buildings in regions of moderate seismicity being evaluated to the Immediate Occupancy Performance Level.

- (C) NC N/A OVERTURNING: The ratio of the effective horizontal dimension, at the foundation level of the lateral-force-resisting system, to the building height (base/height) shall be greater than 0.6S_v. (Tier 2: Sec. 4.7.3.2)

Chapter 3.0 - Screening Phase (Tier 1)

- | | | | |
|---|----|-----|--|
| C | NC | N/A | TIES BETWEEN FOUNDATION ELEMENTS: The foundation shall have ties adequate to resist seismic forces where footings, piles, and piers are not restrained by beams, slabs, or soils classified as Class A, B, or C. (Tier 2: Sec. 4.7.3.3) |
| C | NC | N/A | DEEP FOUNDATIONS: Piles and piers shall be capable of transferring the lateral forces between the structure and the soil. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.4) |
| C | NC | N/A | SLOPING SITES: The grade difference from one side of the building to another shall not exceed one-half the story height at the location of embedment. This statement shall apply to the Immediate Occupancy Performance Level only. (Tier 2: Sec. 4.7.3.5) |

3.9 Nonstructural Checklists

The following checklists are included in this Section:

- Basic Nonstructural Component Checklist, and
- Supplemental Nonstructural Component Checklist.

These checklists shall be completed when required by Table 3-2. The Basic Nonstructural Component Checklist shall be completed prior to completing the Supplemental Nonstructural Component Checklist.

3.9.1 Basic Nonstructural Component Checklist

This Basic Nonstructural Component Checklist shall be completed when required by Table 3-2.

Each of the evaluation statements on this checklist shall be marked compliant (C), non-compliant (NC), or not applicable (N/A) for a Tier 1 Evaluation. Compliant statements identify issues that are acceptable according to the criteria of this Handbook, while non-compliant statements identify issues that require further investigation. Certain statements may not apply to the buildings being evaluated. For non-compliant evaluation statements, the design professional may choose to conduct further investigation using the corresponding Tier 2 evaluation procedure; the section numbers in parentheses following each evaluation statement correspond to Tier 2 evaluation procedures.

Partitions

- C (NC) N/A UNREINFORCED MASONRY: Unreinforced masonry or hollow clay tile partitions shall be braced at a spacing of equal to or less than 10 feet in regions of low and moderate seismicity and 6 feet in regions of high seismicity. (Tier 2: Sec. 4.8.1.1)

Ceiling Systems

- C (NC) N/A INTEGRATED CEILINGS: Integrated suspended ceilings at exits and corridors or weighing more than 2 lb/ft² shall be laterally restrained with a minimum of 4 diagonal wires or rigid members attached to the structure above at a spacing of equal to or less than 12 ft. (Tier 2: Sec. 4.8.2.1)
- C NC (N/A) LAY-IN TILES: Lay-in tiles used in ceiling panels located at exitways and corridors shall be secured with clips. (Tier 2: Sec. 4.8.2.2)
- C (NC) N/A SUPPORT: The integrated suspended ceiling system shall not be used to laterally support the tops of gypsum board, masonry, or hollow clay tile partitions. (Tier 2: Sec. 4.8.2.3)
- C NC (N/A) SUSPENDED LATH AND PLASTER: Ceilings consisting of suspended lath and plaster or gypsum board shall be attached for each 10 square feet of area. (Tier 2: Sec. 4.8.2.4)

Light Fixtures

- C (NC) N/A INDEPENDENT SUPPORT: Light fixtures in suspended grid ceilings shall be supported independently of the ceiling suspension system by a minimum of two wires at diagonally opposite corners of the fixtures. (Tier 2: Sec. 4.8.3.1)
- C (NC) N/A EMERGENCY LIGHTING: Emergency lighting shall be anchored or braced to prevent falling or swaying during an earthquake. (Tier 2: Sec. 4.8.3.2)

Cladding and Glazing

- C NC (N/A) CLADDING ANCHORS: Cladding components weighing more than 10 psf shall be anchored to the exterior wall framing at a spacing equal to or less than 6 ft. for Life Safety and 4 ft. for Immediate Occupancy. (Tier 2: Sec. 4.8.4.1)
- C NC (N/A) CLADDING ISOLATION: For moment frame buildings of steel or concrete, panel connections shall be detailed to accommodate a drift ratio of 0.02 for Life Safety and 0.01 for Immediate Occupancy. (Tier 2: Sec. 4.8.4.2)
- C NC (N/A) MULTISTORY PANELS: For multistory panels attached at each floor level, the panels and connections shall be able to accommodate a drift ratio of 0.02 for Life Safety and 0.01 for Immediate Occupancy. (Tier 2: Sec. 4.8.4.3)

Chapter 3.0 - Screening Phase (Tier 1)

- | | | | |
|---|----|-------|---|
| C | NC | (N/A) | BEARING CONNECTIONS: Where bearing connections are required, there shall be a minimum of two bearing connections for each wall panel. (Tier 2: Sec. 4.8.4.4) |
| C | NC | (N/A) | INSERTS: Where inserts are used in concrete connections, the inserts shall be anchored to reinforcing steel. (Tier 2: Sec. 4.8.4.5) |
| C | NC | (N/A) | PANEL CONNECTIONS: Exterior cladding panels shall be anchored with a minimum of 2 connections for each wall panel for Life Safety and 4 connections for Immediate Occupancy. (Tier 2: Sec. 4.8.4.6) |
| C | NC | (N/A) | DETERIORATION: There shall be no evidence of deterioration or corroding in any of the connection elements. (Tier 2: Sec. 4.8.4.7) |
| C | NC | (N/A) | DAMAGE: There shall be no damage to exterior wall cladding. (Tier 2: Sec. 4.8.4.8) |
| C | NC | (N/A) | GLAZING: Glazing in curtain walls and individual panes over 16 square feet in area, located up to a height of 10 feet above an exterior walking surface, shall be laminated annealed or heat strengthened safety glass that will remain in the frame when cracked. (Tier 2: Sec. 4.8.4.9) |

Masonry Veneer

- | | | | |
|---|----|-------|--|
| C | NC | (N/A) | SHELF ANGLES: Masonry veneer shall be supported by shelf angles or other elements at each floor above the first floor. (Tier 2: Sec. 4.8.5.1) |
| C | NC | (N/A) | TIES: Masonry veneer shall be connected to the back-up with corrosion-resistant ties. The ties shall have a spacing of equal to or less than 36" for Life Safety and 24" for Immediate Occupancy with a minimum of one tie for every 2-2/3 square feet. (Tier 2: Sec. 4.8.5.2) |
| C | NC | (N/A) | WEAKENED PLANES: Masonry veneer shall be anchored to the back-up at locations of flashing. (Tier 2: Sec. 4.8.5.3) |

Parapets, Cornices, Ornamentation and Appendages

- | | | | |
|---|------|-------|---|
| C | (NC) | N/A | URM PARAPETS: There shall be no laterally unsupported unreinforced masonry parapets or cornices above the highest anchorage level with height-to-thickness ratios greater than 1.5 in regions of high seismicity and 2.5 in regions of moderate or low seismicity. (Tier 2: Sec. 4.8.8.1) |
| C | NC | (N/A) | CANOPIES: Canopies located at building exits shall be anchored at a spacing 10 feet for Life Safety and 6 feet for Immediate Occupancy. (Tier 2: Sec. 4.8.8.2) |

Masonry Chimneys

- | | | | |
|---|----|-------|---|
| C | NC | (N/A) | URM: No unreinforced masonry chimney shall extend above the roof surface more than twice the least dimension of the chimney. (Tier 2: Sec. 4.8.9.1) |
| C | NC | (N/A) | MASONRY: Masonry chimneys shall be anchored to the floor and roof. (Tier 2: Sec. 4.8.9.2) |

Stairs

- | | | | |
|-----|----|-------|---|
| C | NC | (N/A) | URM WALLS: Walls around stair enclosures shall not consist of unbraced hollow clay tile or unreinforced masonry. (Tier 2: Sec. 4.8.10.1) |
| (C) | NC | N/A | STAIR DETAILS: In moment frame structures, the connection between the stairs and the structure shall not rely on shallow anchors in concrete. Alternatively, the stair details shall be capable of accommodating the drift calculated using the Quick Check Procedure of Section 3.5.3.1 without inducing tension in the anchors. (Tier 2: Sec. 4.8.10.2) |

Chapter 3.0 - Screening Phase (Tier 1)

Building Contents and Furnishing

- C (NC) N/A TALL NARROW CONTENTS: Contents with a height-to-depth ratio greater than 3 for Immediate Occupancy and 4 for Life Safety shall be anchored to the floor slab or adjacent walls. (Tier 2: Sec. 4.8.11.1)

Mechanical and Electrical Equipment

- C (NC) N/A EMERGENCY POWER: Equipment used as part of an emergency power system shall be mounted to maintain continued operation after an earthquake. (Tier 2: Sec. 4.8.12.1)
- C (NC) N/A HEAVY EQUIPMENT: Equipment weighing over 20 lb that is attached to ceilings, walls, or other supports 4 ft. above the floor level shall be braced. (Tier 2: Sec. 4.8.12.2)

Piping

- C (NC) N/A FIRE SUPPRESSION PIPING: Fire suppression piping shall be anchored and braced in accordance with *NFPA-13* (NFPA, 1996). This statement need not be evaluated for buildings in regions of moderate seismicity being evaluated to the Life Safety Performance Level. (Tier 2: Sec. 4.8.13.1)
- C (NC) N/A FLEXIBLE COUPLINGS: Fluid, gas and fire suppression piping shall have flexible couplings. This statement need not be evaluated for buildings in regions of moderate seismicity being evaluated to the Life Safety Performance Level. (Tier 2: Sec. 4.8.13.2)

Hazardous Materials Storage and Distribution

- C (NC) N/A TOXIC SUBSTANCES: Toxic and hazardous substances stored in breakable containers shall be restrained from falling by latched doors, shelf lips, wires, or other methods. (Tier 2: Sec. 4.8.15.1)

3.9.1S Supplemental Nonstructural Component Checklist

This Supplemental Nonstructural Component Checklist shall be completed when required by Table 3-2. The Basic Nonstructural Component Checklist shall be completed prior to completing this Supplemental Nonstructural Component Checklist.

Partitions

- C (NC) N/A DRIFT: The drift ratio for masonry partitions shall be limited to 0.005. (Tier 2: Sec. 4.8.1.2)
- C (NC) N/A STRUCTURAL SEPARATIONS: Partitions at structural separations shall have seismic or control joints. (Tier 2: Sec. 4.8.1.3)
- C (NC) N/A TOPS: The tops of framed or panelized partitions that only extend to the ceiling line shall have lateral bracing to the building structure at a spacing of equal to or less than 6 feet. (Tier 2: Sec. 4.8.1.4)

Ceiling Systems

- C (NC) N/A EDGES: The edges of integrated suspended ceilings shall be separated from enclosing walls by a minimum of 1/2". (Tier 2: Sec. 4.8.2.5)
- C NC (N/A) SEISMIC JOINT: The ceiling system shall not extend continuously across any seismic joint. (Tier 2: Sec. 4.8.2.6)

Light Fixtures

- C NC (N/A) PENDANT SUPPORTS: Light fixtures on pendant supports shall be attached at a spacing of equal to or less than 6 ft. and, if rigidly supported, shall be free to move without damaging adjoining materials. (Tier 2: Sec. 4.8.3.3)
- (C) NC N/A LENS COVERS: Lens covers on fluorescent light fixtures shall be attached or supplied with safety devices. (Tier 2: Sec. 4.8.3.4)

Masonry Veneer

- C NC (N/A) MORTAR: The mortar in masonry veneer shall not be easily scraped away from the joints by hand with a metal tool, and there shall not be significant areas of eroded mortar. (Tier 2: Sec. 4.8.5.4)
- C NC (N/A) WEEP HOLES: Weep holes shall be present and base flashing shall be installed. (Tier 2: Sec. 4.8.5.5)
- C NC (N/A) CORROSION: Corrosion of veneer ties, tie screws, studs, and stud tracks shall be minimal. (Tier 2: Sec. 4.8.5.6)
- C NC (N/A) STONE PANELS: Stone panels less than 2 inches nominal thickness shall be anchored every 2 square feet of area. (Tier 2: Sec. 4.8.5.7)
- C NC (N/A) CRACKS: There shall no be visible cracks or weak veins in the stone. (Tier 2: Sec. 4.8.5.8)

Metal Stud Back-Up Systems

- C (NC) N/A STUD TRACKS: Stud tracks shall be fastened to structural walls or floors at a spacing of equal to or less than 24 inches. (Tier 2: Sec. 4.8.6.1)
- (C) NC N/A OPENINGS: Additional steel studs shall frame window and door openings. (Tier 2: Sec. 4.8.6.2)

Concrete Block and Masonry Back-Up Systems

- C (NC) N/A CONCRETE BLOCK: Concrete block shall qualify as reinforced masonry. (Tier 2: Sec. 4.8.7.1)
- C (NC) N/A BACK-UP: Concrete block back-up shall be anchored to the structural frame at a spacing of equal to or less than 4 feet along the floors and roof. (Tier 2: Sec. 4.8.7.2)
- C (NC) N/A URM BACK-UP: There shall not be any unreinforced masonry back-up. (Tier 2: Sec. 4.8.7.3)

Parapets, Cornices, Ornamentation and Appendages

- C (NC) N/A CONCRETE PARAPETS: Concrete parapets with height-to-thickness ratios greater than 2.5 shall have vertical reinforcement. (Tier 2: Sec. 4.8.8.3)
- C (NC) N/A APPENDAGES: Cornices, parapets, signs, and other appendages that extend above the highest anchorage level or cantilever from exterior wall faces and other exterior wall ornamentation shall be reinforced and anchored to the structural system at a spacing of equal to or less than 10 ft. for Life Safety and 6 ft. for Immediate Occupancy. (Tier 2: Sec. 4.8.8.4)

Building Contents and Furnishing

- C (NC) N/A FILE CABINETS: File cabinets arranged in groups shall be attached to one another. (Tier 2: Sec. 4.8.11.2)
- C (NC) N/A DRAWERS: Cabinet drawers shall have latches to keep them closed during an earthquake. (Tier 2: Sec. 4.8.11.3)
- C NC (N/A) COMPUTER ACCESS FLOORS: Computer access floors shall be braced. (Tier 2: Sec. 4.8.11.4)
- C NC (N/A) ACCESS FLOORS: Equipment supported on access floor systems shall be either attached to the structure or fastened to a laterally braced floor system. (Tier 2: Sec. 4.8.11.5)

Mechanical and Electrical Equipment

- C (NC) N/A HEAVY EQUIPMENT: Equipment weighing over 100 lb. shall be anchored to the structure or foundation. (Tier 2: Sec. 4.8.12.3)
- (C) NC N/A VIBRATION ISOLATORS: Equipment mounted on vibration isolators shall be equipped with restraints or snubbers. (Tier 2: Sec. 4.8.12.4)
- C (NC) N/A ELECTRICAL EQUIPMENT: Electrical equipment shall be attached to the structural system. (Tier 2: Sec. 4.8.12.5)

Piping

- C (NC) N/A FLUID AND GAS PIPING: Fluid and gas piping shall be anchored and braced to the structure in accordance with *SP-58* (MSS, 1993). (Tier 2: Sec. 4.8.13.3)
- (C) NC N/A SHUT-OFF VALVES: Shut-off devices shall be present at building utility interfaces to shut off the flow of gas and high temperature energy in the event of earthquake-induced failure. (Tier 2: Sec. 4.8.13.4)
- C (NC) N/A C-CLAMPS: One-sided C-clamps that support major piping shall not be unrestrained. (Tier 2: Sec. 4.8.13.5)

Chapter 3.0 - Screening Phase (Tier 1)

Ducts

- C NC (N/A) DUCT BRACING: Rectangular ductwork exceeding 6 square feet in cross-sectional area, and round ducts exceeding 28" in diameter shall be braced. Maximum transverse bracing shall not exceed 40 feet for Life Safety and 30 feet for Immediate Occupancy. Maximum longitudinal bracing shall not exceed 80 feet for Life Safety and 60 feet for Immediate Occupancy. Intermediate supports shall not be considered part of the lateral-force-resisting system. (Tier 2: Sec. 4.8.14.1)
- C NC (N/A) STAIR AND SMOKE DUCTS: Stair pressurization and smoke control ducts shall be braced and shall have flexible connections at seismic joints. (Tier 2: Sec. 4.8.14.2)
- (C) NC N/A DUCT SUPPORT: Ducts shall not be supported by piping or other nonstructural elements. (Tier 2: Sec. 4.8.14.3)

Hazardous Materials Storage and Distribution

- C NC (N/A) GAS CYLINDERS: Compressed gas cylinders shall be restrained. (Tier 2: Sec. 4.8.15.2)
- C NC (N/A) HAZARDOUS MATERIALS: Piping containing hazardous materials shall have shut-off valves or other devices to prevent major spills or leaks. (Tier 2: Sec. 4.8.15.3)

Elevators

- C NC (N/A) SUPPORT SYSTEM: All elements of the elevator system shall be anchored. (Tier 2: Sec. 4.8.16.1)
- C NC (N/A) SEISMIC SWITCH: All elevators shall be equipped with seismic switches that will terminate operations when the ground motion exceeds 0.10g. (Tier 2: Sec. 4.8.16.2)
- C NC (N/A) SHAFT WALLS: All elevator shaft walls shall be anchored and reinforced to prevent toppling into the shaft during strong shaking. (Tier 2: Sec. 4.8.16.3)
- C NC (N/A) RETAINER GUARDS: Cable retainer guards on sheaves and drums shall be present to inhibit the displacement of cables. (Tier 2: Sec. 4.8.16.4)
- C NC (N/A) RETAINER PLATE: A retainer plate shall be present at the top and bottom of both car and counterweight. (Tier 2: Sec. 4.8.16.5)
- C NC (N/A) COUNTERWEIGHT RAILS: All counterweight rails shall be sized to current industry standards and shall be larger than eight-pound rails. (Tier 2: Sec. 4.8.16.6)
- C NC (N/A) BRACKETS: The brackets that tie the counterweight rail to the building structure shall be sized to meet industry standards and shall have a spacing of 8 feet or less. (Tier 2: Sec. 4.8.16.7)
- C NC (N/A) SPREADER BRACKET: Spreader brackets shall not be used to resist seismic forces. (Tier 2: Sec. 4.8.16.8)

**APPENDIX HP
HISTORICAL PRESERVATION
REPORT**



ARCHITECTURE
INTERIOR ARCHITECTURE
PHYSICAL PLANNING

28 June 2001

FY01 MCA PN 52265
Whole Barracks Renewal Quad "F" Renovations
Schofield Barracks, Oahu, Hawaii

**ARCHITECTURAL RECOMMENDATIONS FOR
SEISMIC EVALUATION AND ANTI-TERRORISM FORCE PROTECTION STUDY
FOR RENOVATIONS OF QUAD "F"**

I. PURPOSE:

Since Quad F is listed on the National Historic Register of Historic Places and an integral part of the Schofield Barracks Historic District, the following architectural recommendations supplements the Seismic Evaluation and Anti-Terrorism/Force Protection (AT/FP) Study for Renovations of Quad F as prepared by SSFM International. Figures Nos. refer to drawings of the above report.

II. REFERENCES:

- A. Draft Report "Historic Architectural Survey for Significant Features in Quads B, C, D, E, & F and Condition Assessment of Quad F" prepared by Fung Associates with Mason Architects, Inc, & HL & L Corporation for the Environmental Branch USAED Honolulu, Building 252, Fort Shafter, Hawaii 96858-5440 dated February, 2001.

III. RECOMMENDATIONS:

A. GENERAL:

1. Quad F is composed of four, three story buildings sited to enclose the four sides of the central courtyard designed in a modest Second Renaissance Revival Style. The overall massing and shape maintains strong linear and horizontal emphasis of line, especially on exterior street facade at arcade openings.
2. Significant Exterior Architectural Features of Quad F include:
 - a. Arcade galleries or walkways with rectangular openings
 - b. Rectilinear shaped windows

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- c. Exterior stucco facade with horizontal base course, frieze adornment, and cornice detail.
- d. Stair and arcade railings
- e. Portico main entrance on Building 649 only.
- f. Balcony/balustrade at Building 649 only.

3. QUAD F RECOMMENDATIONS:

- a. Exterior windows shall be revised to be of aluminum sections per AT/FP guidelines and shall accommodate appropriate thickness of laminated glass. Per AT/FP requirements, grids must be applied rather than the true divided light of the original windows to replicate original 6/6 divided light pattern.
- b. Exterior walls, if altered must be finished with cement plaster to match existing wall texture without any additional reveals or surface material breaks.
- c. Interior alterations proposed by Seismic Evaluation and AT/FP Study does not adversely affect significant historic features of Quad F, therefore these retrofit items will not be commented on.
- d. For all beam retrofit conditions and where major portion of the existing exterior infill walls are to be demolished and reconstructed due to AT/FP guidelines, all work that affects the exterior must be reviewed and approved by the State of Hawaii Historic Preservation Office.

B. BUILDING 649

1. FIGURE 3: Second Floor Plan & FIGURE 4: Third Floor Plan

- a. Beam Retrofit Schedule Notes: This retrofit condition occurs consistently at second and third floors of all four Quad F Buildings. Horizontal proportions of floor slab thickness and beam configurations must be maintained as to not alter the original horizontal proportions of the original facade.

C. BUILDING 650

1. FIGURE 5: First Floor Plan

- a. Shearwall Retrofit Schedule Notes:
Exterior building infill walls fronting Foote Avenue: A major portion of the First Floor exterior wall will be demolished and reconstructed due to AT/FP guidelines. Upon research, there are no available As-Built Drawings that identify the original design intent of the window fenestration on this facade. Therefore, the window openings of re-constructed wall shall be rectilinear in shape, identical to the building's end wall fenestration openings.

2. FIGURE 6: Second Floor Plan

a. Miscellaneous Retrofit Schedule Notes:

Floor slab retrofit: Existing second floor slabs at exterior balconies fronting Foote Avenue lack required minimum standoff distances as required by AT/FP guidelines and therefore must be rebuilt, including beam reconstruction. Horizontal proportions of floor slab thickness and beam configurations must be maintained as to not alter the original horizontal proportions of the original facade.

As an alternate design, building up the existing floor slab thickness may strengthen the existing slab. Horizontal proportions of floor slab to railing intersections must be respected as per the original building As-Built Drawings.

b. Beam Retrofit Schedule Notes:

Existing concrete beam must be demolished and re-built due to increased strength required of beams that supports exterior exit balconies. Existing beams along Foote Avenue facades will be demolished and new concrete beam depth will be increased. This should not adversely affect the original horizontal proportions of the floor slab/beams.

3. FIGURE 7: Third Floor Plan

a. Beam Retrofit Schedule Notes: (exterior and interior courtyard facades)

Existing third floor slabs at exterior balconies fronting surrounding streets, lacks the required minimum standoff distances as required by AT/FP guidelines and therefore must be strengthened, including beam reconstruction. Horizontal proportions of floor slab thickness and beam configurations must be maintained as to not alter the original horizontal proportions of the original facade.

D. BUILDING 651 (BUILDING 652 IDENTICAL)

1. FIGURE 8: First Floor Plan

a. Shearwall Retrofit Schedule Notes:

Exterior building infill walls fronting Foote Avenue: A major portion of the First Floor exterior wall will be demolished and reconstructed due to AT/FP guidelines. Upon research, there are no available As-Built Drawings that identify the original design intent of the window fenestration on these facades. Therefore, the window openings of re-constructed wall shall be rectilinear in shape, identical to the building's end wall fenestration openings.

2. FIGURE 9: Second Floor Plan

a. Miscellaneous Retrofit Schedule Notes:

Floor slab retrofit: Existing second floor slabs at exterior balconies fronting surrounding streets lack required minimum standoff distances as required by AT/FP guidelines and therefore must be rebuilt, including beam reconstruction. Horizontal proportions of floor slab thickness and beam configurations must be maintained as to not alter the original horizontal proportions of the original facade.

As an alternate design, building up the existing floor slab thickness may strengthen the existing slab. Horizontal proportions of floor slab to railing intersections must be respected as per the original building as-built drawings.

b. Beam Retrofit Schedule Notes:

Existing concrete beam must be demolished and re-built due to increased strength required of beams that supports exterior exit balconies. Existing beams along surround street facades will be demolished and new concrete beam depth will be increased. This should not adversely affect the original horizontal proportions of the floor slab/beams.

3. FIGURE 10: Third Floor Plan

a. Beam Retrofit Schedule Notes: (exterior and interior courtyard facades)

Existing third floor slabs at exterior balconies fronting surrounding streets, lacks the required minimum standoff distances as required by AT/FP guidelines and therefore must be strengthened, including beam reconstruction. Horizontal proportions of floor slab thickness and beam configurations must be maintained as to not alter the original horizontal proportions of the original facade.

IV. HISTORIC BUILDING REVIEW AND APPROVALS:

Since Quad F is situated within the Schofield Barracks Historic District which is listed on the National Register of Historic Places, all work performed to Quad F must be processed and approved by the State of Hawaii Historic Preservation Office.