

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. CONTRACT ID CODE	PAGE OF PAGES	
2. AMENDMENT/MODIFICATION NO. AM-0001			J	1	2
3. EFFECTIVE DATE 04JUN2004		4. REQUISITION/PURCHASE REQ. NO. WX3JR9-3202-7174		5. PROJECT NO.(If applicable)	
6. ISSUED BY CONTRACTING DIVISION USAED, HONOLULU BLDG S230 FT. SHAFTER HI 96858-5440		CODE W9128A	7. ADMINISTERED BY (If other than item 6) See Item 6		
8. NAME AND ADDRESS OF CONTRACTOR (No., Street, County, State and Zip Code)			<input checked="" type="checkbox"/>	9A. AMENDMENT OF SOLICITATION NO. W9128A-04-B-0003	
			<input checked="" type="checkbox"/>	9B. DATED (SEE ITEM 11) 18-May-2004	
				10A. MOD. OF CONTRACT/ORDER NO.	
				10B. DATED (SEE ITEM 13)	
CODE		FACILITY CODE			
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offer <input type="checkbox"/> is extended, <input checked="" type="checkbox"/> is not extended.					
Offer must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. ACCOUNTING AND APPROPRIATION DATA (If required)					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS. IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.					
A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.					
B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(B).					
C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:					
D. OTHER (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input type="checkbox"/> is required to sign this document and return _____ copies to the issuing office.					
14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.) Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii (See Page 2)					
Except as provided herein, all terms and conditions of the document referenced in Item 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.					
15A. NAME AND TITLE OF SIGNER (Type or print)			16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print)		
			TEL:	EMAIL:	
15B. CONTRACTOR/OFFEROR (Signature of person authorized to sign)		15C. DATE SIGNED	16B. UNITED STATES OF AMERICA BY (Signature of Contracting Officer)		16C. DATE SIGNED

1. CHANGES TO SPECIFICATIONS. Attached hereto are revised pages to the solicitation/specifications. The revision mark "(AM-0001)" is shown on each page.

A. REVISED PAGES/PARAGRAPHS. The following are revised pages and/or paragraphs to the solicitation/specifications. Revised pages replaces like-numbered pages. Changes are indicated in **bold**.

Bidding Schedule, Section 00010, Page 00010-3 thru 00010-4, Item No. 3
Section 00700, Page 00700-69
Section 00700, Page 00700-100 and 00700-101
Section 00900, Page 00900-1
Project Table of Contents
Submittal Register
Section 01430 paragraphs, 3.1.4.3, 3.1.4.4, Attachments 1, 2, and 3
Section 01451 paragraphs, 3.1.1, 3.4.2
Section 01900 paragraphs, 1.1, 1.5.4, 1.11.1, Attachment 1
Section 02215 revised Section Title and paragraph 3.1
Section 02390 paragraphs, 1.1, 2.2.1, 2.2.2, 2.2.3, 3.1, 3.2.1, 3.2.2, 3.2.3, 3.2.4,
Section 02485 paragraphs, 1.2, 1.3, 1.3.1, 1.3.2, 1.3.3, PART 3
Section 02486 paragraphs, 1.2, 2.1, 3.4.4, 3.7.3.1, 3.7.3.2, 3.8
Section 03110 paragraphs, 1.3
Section 03300 paragraphs, 1.6.1, 3.2.1, 3.10
Section 03310 paragraphs, 1.2, 1.3.3, 1.5.3, 2.1.9, 3.1.1, 3.3.1, 3.3.5, 3.6.1,

B. NEW PAGES. The following pages are added to the specification:

Section 00900, Responses to Contractor Questions, Page 00900-2
Section 01525 pages 1 through 16

C. DELETED CLAUSE: The following clause is deleted from the solicitation:

Section 00700 - 252.236-7003 Payment for Mobilization and Preparatory work (JAN 1997)

2. The closing date specified for receipt of bids is not extended. Bids are due 18 June 2004, 2:00 PM (Hawaiian Standard Time)

-- End of Section --

SECTION 00010

BIDDING SCHEDULE AND PAYMENTS
 KAUMALAPAU HARBOR BREAKWATER REPAIR
 ISLAND OF LANAI, HAWAII

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	AMOUNT
1.	Mobilization and Demobilization	1	Lump Sum	\$_____
2.	Casting and Placing Core-Loc Units	1	Lump Sum	\$_____
3.	Breakwater	1	Lump Sum	\$_____
TOTAL BIDDING SCHEDULE				\$_____

Note: Failure to bid on all the items in the Bidding Schedule will cause the bid to be considered non-responsive.

PAYMENTS

Compensation for all work to be performed under this contract will be made under the payment item(s) listed herein. The principal features of the work to be included under the payment item(s) are noted. Work required by the drawings and specifications and not particularly mentioned shall be included in and paid for under the contract price for the item to which the work pertains. Price(s) and payment(s) for the Item(s) shall cover all work, complete and finished in accordance with the specifications, schedules, and drawings, and shall be full compensation for all work in connection therewith, including quality control and cost of performance and payment bond premiums as specified in the CONTRACT CLAUSES. Price(s) and payment(s) shall constitute full and final compensation for furnishing all materials, equipment, management, supervision, labor, transportation, fuel power, water and all incidental items necessary to complete the work, except as otherwise specified to be furnished by the Government. for the purpose of CONTRACT CLAUSE entitled "PROMPT PAYMENT FOR CONSTRUCTION CONTRACTS," the term "designated billing office" and "designated payment office" are as follows:

a. Billing Office

U.S. Army Engineer Division, Pacific Ocean
Fort Shafter Resident Office, Bldg. 230
Fort Shafter, Hawaii 96858-5440

b. Payment Office

USACE Finance Center
Attn: CEFC- FP
5722 Integrity Drive
Millington, TN 38054-5005

Item numbers mentioned hereinafter correspond to the item numbers in the BIDDING SCHEDULE.

a. Item No. 1, MOBILIZATION AND DEMOBILIZATION, will be paid for at the contract price, complete, including miscellaneous items, and all the incidental items necessary to complete the work. This item shall include all work not called for by any other bid item. Payment shall also include the cost of premiums for performance and payment bonds specified in the SPECIAL CONTRACT CLAUSES. Payment for this item will be in the proportion of 70 percent mobilization and 30 percent demobilization.

b. Item No. 2, CASTING AND PLACING CORE-LOC UNITS, will be paid for at the contract price, including finishing, curing and storing, and all incidental items necessary to complete the work.

c. **Item No. 3, BREAKWATER, will be paid for at the contract price, complete in place and ready for use, including site preparation, quarrying or borrowing, hauling, stockpiling, placement of stones, removal and replacing rejected stones, excavation for leveling, core shaping and toe keying, concrete cap, furnishing and placing geotextile filter fabric, cleanup, and all incidental items necessary to complete the work.** Casting and placement of core-locs are covered under Item No. 2.

to stop performance of the work called for by this contract. The order shall be specifically identified as a stop-work order issued under this clause. Upon receipt of the order, the Contractor shall immediately comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Upon receipt of the final decision in the protest, the Contracting Officer shall either--

(1) Cancel the stop-work order; or

(2) Terminate the work covered by the order as provided in the Default, or the Termination for Convenience of the Government, clause of this contract.

(b) If a stop-work order issued under this clause is canceled either before or after a final decision in the protest, the Contractor shall resume work. The Contracting Officer shall make an equitable adjustment in the delivery schedule or contract price, or both, and the contract shall be modified, in writing, accordingly, if--

(1) The stop-work order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract; and

(2) The Contractor asserts its right to an adjustment within 30 days after the end of the period of work stoppage; provided, that if the Contracting Officer decides the facts justify the action, the Contracting Officer may receive and act upon a proposal at any time before final payment under this contract.

(c) If a stop-work order is not canceled and the work covered by the order is terminated for the convenience of the Government, the Contracting Officer shall allow reasonable costs resulting from the stop-work order in arriving at the termination settlement.

(d) If a stop-work order is not canceled and the work covered by the order is terminated for default, the Contracting Officer shall allow, by equitable adjustment or otherwise, reasonable costs resulting from the stop-work order.

(e) The Government's rights to terminate this contract at any time are not affected by action taken under this clause.

(f) If, as the result of the Contractor's intentional or negligent misstatement, misrepresentation, or miscertification, a protest related to this contract is sustained, and the Government pays costs, as provided in FAR 33.102(b)(2) or 33.104(h)(1), the Government may require the Contractor to reimburse the Government the amount of such costs. In addition to any other remedy available, and pursuant to the requirements of Subpart 32.6, the Government may collect this debt by offsetting the amount against any payment due the Contractor under any contract between the Contractor and the Government.

(End of clause)

52.236-1 PERFORMANCE OF WORK BY THE CONTRACTOR (APR 1984)

The Contractor shall perform on the site, and with its own organization, work equivalent to at least **twenty-five (25) percent** of the total amount of work to be performed under the contract. This percentage may be reduced by a supplemental agreement to this contract if, during performing the work, the Contractor requests a reduction and the Contracting Officer determines that the reduction would be to the advantage of the Government.

(End of clause)

- (2) Give immediate notice, with description and locations of any such obstructions, to the Contracting Officer; and
 - (3) When required by the Contracting Officer, mark or buoy such obstructions until the same are removed.
- (b) The Contracting Officer may --
- (1) Remove the obstructions by contract or otherwise should the Contractor refuse, neglect, or delay compliance with paragraph (a) of this clause; and
 - (2) Deduct the cost of removal from any monies due or to become due to the Contractor; or
 - (3) Recover the cost of removal under the Contractor's bond.
- (c) The Contractor's liability for the removal of a vessel wrecked or sunk without fault or negligence is limited to that provided in sections 15, 19, and 20 of the River and Harbor Act of March 3, 1899 (33 U.S.C. 410 et. seq.).

~~252.236-7003 PAYMENT FOR MOBILIZATION AND PREPARATORY WORK (JAN 1997)~~

- ~~(a) The Government will make payment to the Contractor under the procedures in this clause for mobilization and preparatory work under item no. 1.~~
- ~~(b) Payments will be made for actual payments by the Contractor on work preparatory to commencing actual work on the construction items for which payment is provided under the terms of this contract, as follows--~~
- ~~(1) For construction plant and equipment exceeding \$25,000 in value per unit (as appraised by the Contracting Officer at the work site) acquired for the execution of the work;~~
 - ~~(2) Transportation of all plant and equipment to the site;~~
 - ~~(3) Material purchased for the prosecution of the contract, but not to be incorporated in the work;~~
 - ~~(4) Construction of access roads or railroads, camps, trailer courts, mess halls, dormitories or living quarters, field headquarters facilities, and construction yards;~~
 - ~~(5) Personal services, and--~~
 - ~~(6) Hire of plant.~~
- ~~(c) Requests for payment must include--~~
- ~~(1) An account of the Contractor's actual expenditures;~~
 - ~~(2) Supporting documentation, including receipted bills or certified copies of payrolls and freight bills; and~~
 - ~~(3) The Contractor's documentation--~~
- ~~(i) Showing that it has acquired the construction plant, equipment, and material free from all encumbrances;~~
 - ~~(ii) Agreeing that the construction plant, equipment, and material will not be removed from the site without the written permission of the Contracting Officer; and~~
 - ~~(iii) Agreeing that structures and facilities prepared or erected for the prosecution of the contract work will~~

~~be maintained and not dismantled prior to the completion and acceptance of the entire work, without the written permission of the Contracting Officer.~~

~~(d) Upon receiving a request for payment, the Government will make payment, less any prescribed retained percentage, if--~~

~~(1) The Contracting Officer finds the--~~

~~(i) Construction plant, material, equipment, and the mobilization and preparatory work performed are suitable and necessary to the efficient prosecution of the contract; and~~

~~(ii) Preparatory work has been done with proper economy and efficiency.~~

~~(2) Payments for construction plant, equipment, material, and structures and facilities prepared or erected for prosecution of the contract work do not exceed--~~

~~(i) The Contractor's cost for the work performed less the estimated value upon completion of the contract; and~~

~~(ii) 100 percent of the cost to the contractor of any items having no appreciable salvage value; and~~

~~(iii) 75 percent of the cost to the contractor of items which do have an appreciable salvage value.~~

~~(c) (1) Payments will continue to be made for item no. 1, and all payments will be deducted from the contract price for this item, until the total deductions reduce this item to zero, after which no further payments will be made under this item. ---~~

~~(2) If the total of payments so made does not reduce this item to zero, the balance will be paid to the Contractor in the final payment under the contract.~~

~~(3) The retained percentage will be paid in accordance with the Payments to Contractor clause of this contract.~~

~~(f) The Contracting Officer shall determine the value and suitability of the construction plant, equipment, materials, structures and facilities. The Contracting Officer's determinations are not subject to appeal.~~

~~(End of clause)~~

252.236-7004 PAYMENT FOR MOBILIZATION AND DEMOBILIZATION (DEC 1991)

(a) The Government will pay all costs for the mobilization and demobilization of all of the Contractor's plant and equipment at the contract lump sum price for this item.

(1) 70 percent of the lump sum price upon completion of the contractor's mobilization at the work site.

(2) The remaining 30 percent upon completion of demobilization.

(b) The Contracting Officer may require the Contractor to furnish cost data to justify this portion of the bid if the Contracting Officer believes that the percentages in paragraphs (a) (1) and (2) of this clause do not bear a reasonable relation to the cost of the work in this contract.

(1) Failure to justify such price to the satisfaction of the Contracting Officer will result in payment, as determined by the Contracting Officer, of --

(i) Actual mobilization costs at completion of mobilization;

SECTION 00900
Miscellaneous Attachments

Kaunalapau Harbor

Additional information: The following information is provided for bidding purposes only.

ATTACHMENT 1 - Army Diver's Report: This is a 20 meg power point file that is downloadable from the USACE Website. (File name is Attch1.ppt)

ATTACHMENT 2 -Two (2) video files providing Underwater Video footage of the Existing Breakwater is downloadable from the USACE Website. (File name is Attch2a.mpg and Attch2b.mpg)

ATTACHMENT 3 - A VHS tape providing another underwater view of the existing breakwater is available upon request. Due to limited supply, tapes will be limited to one per offeror and will be mailed via regular US Postal Services. Please submit a request by facsimile to Ms. Lucia Gonzalez/Joy Sakamoto at (808) 438-8588. Please allow 5 days from the date USACE receives requests for the video tape to be mailed out. Firms requesting air express service shall furnish completed airbills showing recipient's name, company name, telephone number, company billing account number, and type of delivery required.

ATTACHMENT 4 - Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) Report: The "Decision Document for Kaunalapau Harbor Breakwater Repair, Island of Lanai, Hawaii, February 2003" is available for review by downloading from the USACE Website. (File name is Attch4.pdf)

NOTE: Bidders Attention is directed to Note 6 under Ring 3, Sheet 2 of Drawing titled "Existing Conditions and Survey Controls".

SECTION 00900
RESPONSES TO QUESTIONS
SUBMITTED BY PLANHOLDERS
FOR
IFB NO. W9128A-04-B-0003

Dave Bingham, Traylor Pacific

Q1. 00700-13 – 52.211-10 “When is award anticipated?”

A1. Reference the Standard Form 1442, the Government anticipates to make an award within the bid acceptance period.

Q2. “What are the SBE goals recommended for this project?”

A2. For your information our FY04 Subcontracting targets are:

- Small Business - 58%
- Small Disadvantaged Business - 10%
- Women-Owned Small Business - 10%
- HUBZone Small Business - 3%
- Service-Disabled Veteran Owned Small Business - 3%
- Veteran Owned Small Business - 3%

Q3. Spec. Section 03310, page 12, 2.19 – Calls out Fiber Reinforced concrete. Is the Coreloc concrete intended to be fiber reinforced?

A3. Synthetic reinforcing fibers, as specified under paragraph 2.1.9, Fiber Reinforced Concrete, shall be added to the concrete for core-locs. An amendment will be issued to revise the minimum requirement of the structural fiber to 7.5 pounds per cubic yard of concrete.

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-- End of Project Table of Contents --

SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION

CONTRACTOR

SPECIFICATION SECTION

KAUMALAPAU HARBOR BREAKWATER REPAIR, LANAI HAWAII

01451

ACTIVITY NO.	TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION	CONTRACTOR SCHEDULE DATES				CONTRACTOR ACTION		GOVERNMENT ACTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION

CONTRACTOR

SPECIFICATION SECTION

KAUMALAPAU HARBOR BREAKWATER REPAIR, LANAI HAWAII

02486

ACTIVITY NO.	TRANS-MITTAL NO.	ITEM NO.	SPECIFICATION PARAGRAPH NUMBER	DESCRIPTION OF ITEM SUBMITTED	TYPE OF SUBMITTAL										CLASSIFICATION	CONTRACTOR SCHEDULE DATES				CONTRACTOR ACTION		GOVERNMENT ACTION																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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SUBMITTAL REGISTER
(ER 415 1-10)

CONTRACT NO.

TITLE AND LOCATION

CONTRACTOR

SPECIFICATION SECTION

KAUMALAPAU HARBOR BREAKWATER REPAIR, LANAI HAWAII

03310

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SECTION 01430

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

STATE OF HAWAII DEPARTMENT OF HEALTH (HIDOH)

HIDOH, Chapter 43	Administrative Rules, Title 11, Community Noise Control for Oahu
HIDOH, Chapter 59	Administrative Rules, Ambient Air Quality Standards
HIDOH, Chapter 60	Administrative Rules, Air Pollution Control

1.2 GENERAL REQUIREMENTS

This section covers prevention of environmental pollution and damage as the result of construction operations under this contract and for those measures set forth in the TECHNICAL REQUIREMENTS. For the purpose of this specification, environmental pollution and damage is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of air, water, and land, and includes management of visual aesthetics, noise, solid waste, radiant energy and radioactive materials, as well as other pollutants.

1.2.1 Subcontractors

Assurance of compliance with this section by subcontractors will be the responsibility of the Contractor.

1.2.2 Notification

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with the aforementioned Federal, State or local laws or regulations, permits, and other elements of the Contractor's environmental protection plan. The Contractor shall, after receipt of such notice, inform the Contracting Officer of proposed corrective action and

take such action as may be approved. If the Contractor fails to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions will be granted or costs or damages allowed to the Contractor for any such suspension.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-06 Test Reports

Environmental Protection Plan; G.

Within 30 calendar days of receipt of Notice to Proceed, the Contractor shall submit in writing an environmental protection plan. Approval of the Contractor's plan will not relieve the Contractor of his responsibility for adequate and continuing control of pollutants and other environmental protection measures.

The environmental protection plan shall include but not be limited to the following:

- a. A list of Federal, State, and local laws, regulations, and permits concerning environmental protection, pollution control and abatement that are applicable to the Contractor's proposed operations and the requirements imposed by those laws, regulations, and permits.
- b. Methods for protection of features to be preserved within authorized work areas. The Contractor shall prepare a listing of methods to protect resources needing protection; i.e., trees, shrubs, vines, grasses and ground cover, landscape features, air and water quality, fish and wildlife, soil, historical, archeological, and cultural resources.
- c. Procedures to be implemented to provide the required environmental protection and to comply with the applicable laws and regulations. The Contractor shall set out the procedures to be followed to correct pollution of the environment due to accident, natural causes, or failure to follow the procedures set out in accordance with the environmental protection plan.
- d. Location of the solid waste disposal area.
- e. Drawings showing locations of any proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials.

- f. Environmental monitoring plans for the job site, including land, water, air, and noise monitoring.
- g. Traffic control plan.
- h. Methods of protecting surface and ground water during construction activities.
- i. Work area plan showing the proposed activity in each portion of the area and identifying the areas of limited use or nonuse. Plan should include measures for marking the limits of use areas.
- j. Plan of borrow area(s).
- k. Training for his personnel during the construction period.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 PROTECTION OF ENVIRONMENTAL RESOURCES

The environmental resources within the project boundaries and those affected outside the limits of permanent work under this contract shall be protected during the entire period of this contract. The Contractor shall confine his activities to areas defined by the drawings and specifications.

3.1.1 Land Resources

Prior to the beginning of any construction, the Contractor shall identify all land resources to be preserved within the Contractor's work area. Except in areas indicated on the drawings or specified to be cleared, the Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without special permission from the Contracting Officer. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such special emergency use is permitted, the Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs.

3.1.1.1 Work Area Limits

Prior to any construction, the Contractor shall mark the areas that are not required to accomplish all work to be performed under this contract. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. The Contractor shall convey to his personnel the purpose of marking and/or protection of all necessary objects.

3.1.1.2 Protection of Landscape

Trees, shrubs, vines, grasses, land forms and other landscape features indicated and defined on the drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

3.1.1.3 Reduction of Exposure of Unprotected Erodible Soils

Earthwork brought to final grade shall be finished as indicated and specified. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Except in instances where the constructed feature obscures borrow areas, quarries, and waste material areas, these areas shall not initially be cleared in total. Clearing of such areas shall progress in reasonably sized increments as needed to use the areas developed as approved by the Contracting Officer.

3.1.1.4 Protection of Disturbed Areas

Such methods as necessary shall be utilized to effectively prevent erosion and control sedimentation, including but not limited to the following:

- a. Retardation and Control of Runoff: Runoff from the construction site shall be controlled by construction of diversion ditches, benches, and berms to retard and divert runoff to protected drainage courses, and any measures required by areawide plans approved under Paragraph 208 of the Clean Water Act.
- b. Erosion and Sedimentation Control Devices: The Contractor shall construct or install all temporary and permanent erosion and sedimentation control features as indicated on the drawings. Temporary erosion and sediment control measures such as berms, dikes, drains, grassing, and mulching shall be maintained until permanent drainage and erosion control facilities are completed and operative.

3.1.1.5 Contractor Facilities and Work Areas

- a. Location of Field Offices, Storage, and Other Contractor Facilities: The Contractors' field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the drawings or as directed by the Contracting Officer. Temporary movement or relocation of Contractor facilities shall be made only on approval by the Contracting Officer.
- b. Borrow Areas on Government Property: Borrow areas shall be managed to minimize erosion and to prevent sediment from entering nearby waters.
- c. Spoil Areas on Government Property: Spoil areas shall be managed and controlled to limit spoil to areas designated on the drawings

and prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall be developed in accordance with the grading plan indicated on the drawings.

- d. Temporary Excavations and Embankments: Temporary excavations and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

3.1.2 Disposal of Wastes

Disposal of wastes shall be as specified in Section 01900 MISCELLANEOUS PROVISIONS and as specified hereinafter.

3.1.2.1 Solid Wastes

Solid wastes (excluding clearing debris) shall be placed in containers which are emptied on a regular schedule. All handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed such that no hazardous or toxic waste will become commingled with solid waste. The Contractor shall transport all solid waste off Government property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal. Designated by the Contracting Officer. The Contractor shall comply with site procedures and with Federal, State, and local laws and regulations pertaining to the use of landfill areas.

3.1.2.2 Chemical Wastes:

Chemical wastes shall be stored in corrosion resistant containers, removed from the work area and disposed of in accordance with Federal, State, and local laws and regulations.

3.1.2.3 Hazardous Wastes:

The Contractor shall take sufficient measures to prevent spillage of hazardous and toxic materials during dispensing and shall collect waste in suitable containers observing compatibility. The Contractor shall transport all hazardous waste off Government property and dispose of it in compliance with Federal and local laws and regulations. Spills of hazardous or toxic materials shall be immediately reported to the Contracting Officer. Cleanup and cleanup costs due to spills shall be the responsibility of the Contractor.

3.1.3 Historical, Archeological, and Cultural Resources

Existing historical, archeological, and cultural resources within the Contractor's work area will be so designated by the Contracting Officer if any has been identified. The Contractor shall take precautions to preserve all such resources as they existed at the time they were pointed out to him. The Contractor shall provide and install all protection for these resources so designated and shall be responsible for their preservation during this contract. If during excavation or other construction

activities, any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. These resources or cultural remains (prehistoric or historic surface or subsurface) include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, paving, wall, or other constructed features; and any indication of agricultural or other uses. Upon such discovery or find, the Contractor shall immediately notify the Contracting Officer. When so notified, the Contracting Officer will initiate action so that prompt and proper data recovery can be accomplished. In the mean time, recording and preservation of historical and archeological finds during construction activities shall be reported in accordance with the SPECIAL CONTRACT REQUIREMENTS.

3.1.4 Water Resources

The Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Special management techniques as set out below shall be implemented to control water pollution by the listed construction activities which are included in this contract.

3.1.4.1 Washing and Curing Water

Waste waters directly derived from construction activities shall not be allowed to enter water areas. These waste waters shall be collected and placed in retention ponds where suspended material can be settled out or the water evaporates so that pollutants are separated from the water.

3.1.4.2 Monitoring of Water Areas:

Monitoring of water areas affected by construction activities shall be the responsibility of the Contractor. All water areas affected by construction activities shall be monitored by the Contractor.

3.1.4.3 Permits and Responsibilities

The following documents contained in this section are made a part of this contract. The Contractor shall comply with all permit requirements applicable to the project construction activities. The documents are annotated as follows: Responsibilities of the Contracting Officer are designated as "CO", responsibilities of the construction contractor are designated as "CC" and joint responsibilities are designated as "CO/CC".

- a. NPDES Permit No. HI0021799, dated July 25, 2003 (Attachment 1)
- b. Section 401 Water Quality Certification (WQC) for Kaumalapau Harbor Breakwater Repair, Island of Lanai, Maui, Hawaii (TMK: 4-9-3:26), File No. WQC 0000535, dated July 15, 2002 (Attachment 2)
- c. Water Quality Monitoring Plan, Kaumalapau Harbor Breakwater Repair, Island of Lanai, Hawaii, dated November 2001 (Attachment 3)

The Contractor shall comply with all permit requirements applicable to the project's construction activities as stipulated in the documents listed above. Although the term "permittee" references the U.S. Army Corps of

Engineers in the NPDES Permit, for project purpose under this contract for the construction of the Kaumalapau Harbor Breakwater Repair, the term "permittee" shall mean the Contractor

3.1.4.4 Environmental Assessment

The Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) prepared for this project are available for review at the offices of the Contracting Officer, Bldg.200, Fort Shafter, Hawaii. Electronic copies are also available on the contracting website for this solicitation.

The Contractor is advised to review the contents of these documents for information that may be useful in its prosecution of the work.

3.1.5 Fish and Wildlife Resources

The Contractor shall keep construction activities under surveillance, management and control to minimize interference with, disturbance to and damage of fish and wildlife. Species that require specific attention along with measures for their protection will be listed by the Contractor prior to beginning of construction operations.

3.1.6 Air Resources

The Contractor shall keep construction activities under surveillance, management and control to minimize pollution of air resources. All activities, equipment, processes, and work operated or performed by the Contractor in accomplishing the specified construction shall be in strict accordance with HDOH, Chapter 59, HDOH, Chapter 60, and all Federal emission and performance laws and standards. Ambient Air Quality Standards set by the Environmental Protection Agency shall be maintained for those construction operations and activities specified in this section. Special management techniques as set out below shall be implemented to control air pollution by the construction activities which are included in the contract.

3.1.6.1 Particulates

- a. Dust particles, aerosols, and gaseous by-products from all construction activities, processing and preparation of materials, such as from asphaltic batch plants, shall be controlled at all times, including weekends, holidays and hours when work is not in progress.
- b. The Contractor shall maintain all excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and all other work areas within or outside the project boundaries free from particulates which would cause the air pollution standards mentioned in paragraph Air Resources, herein before, to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, light bituminous treatment, baghouse, scrubbers, electrostatic precipitators or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated at such intervals as to keep the disturbed area damp

at all times. The Contractor must have sufficient competent equipment available to accomplish this task. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

3.1.6.2 Hydrocarbons and Carbon Monoxide

Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

3.1.6.3 Odors

Odors shall be controlled at all times for all construction activities, processing and preparation of materials.

3.1.6.4 Monitoring of Air Quality

Monitoring of air quality shall be the responsibility of the Contractor. All air areas affected by the construction activities shall be monitored by the Contractor.

3.1.7 Sound Intrusions

The Contractor shall keep construction activities under surveillance, and control to minimize damage to the environment by noise. The Contractor shall comply with the provisions of HDOH, Chapter 43.

3.2 POST CONSTRUCTION CLEANUP

The Contractor shall clean up area(s) used for construction.

3.3 RESTORATION OF LANDSCAPE DAMAGE

The Contractor shall restore all landscape features damaged or destroyed during construction operations outside the limits of the approved work areas. Such restoration shall be in accordance with the plan submitted for approval by the Contracting Officer. This work will be accomplished at the Contractor's expense.

3.4 MAINTENANCE OF POLLUTION CONTROL FACILITIES

The Contractor shall maintain all constructed facilities and portable pollution control devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

3.5 TRAINING OF CONTRACTOR PERSONNEL IN POLLUTION CONTROL

The Contractor shall train his personnel in all phases of environmental protection. The training shall include methods of detecting and avoiding pollution, familiarization with pollution standards, both statutory and contractual, and installation and care of facilities (vegetative covers, and instruments required for monitoring purposes) to ensure adequate and continuous environmental pollution control.

-- End of Section --

Post-It™ brand fax transmittal memo 7671		# of pages ▶ 9	
To	JIM HATASHIMA	From	GERALD Y
Co.	US ARMY CORPS	Co.	CWB/DOH
Dept.		Phone #	586-9304
Fax #	438-0430	Fax #	

LINDA LINGLE
GOVERNOR OF HAWAII



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EWC/CWB

07081PGY.03

July 25, 2003

CERTIFIED MAIL
RETURN RECEIPT REQUESTED
7002 0510 0002 9968 5703

Lt. Colonel David C. Press
District Engineer
U.S. Army Engineer District, Honolulu
U.S. Army Corps of Engineers
Building 230, Room 202
Fort Shafter, Hawaii 96858-5440

Attention: Mr. James Hatashima

Dear Lt. Colonel Press:

In accordance with the provisions of the Clean Water Act, Chapter 342D, Hawaii Revised Statutes, and Chapter 11-55, Administrative Rules, Department of Health (Department), the Department has reviewed the following application for a National Pollutant Discharge Elimination System (NPDES) permit to discharge storm water associated with the construction activities:

<u>Project</u>	<u>NPDES Permit No.</u>
Kaumalapau Harbor Breakwater Repair	HI 0021799

This agency has published a public notice of our proposed action in the **Maui News** on **June 6, 2003**, regarding the above application.

After consideration of the expressed views of all interested persons and agencies, pertinent Federal and State Statutes and Rules regarding the discharge, the Department hereby issues the enclosed NPDES permit for the discharge referred to above. This action does not constitute a significant change from the tentative determination set forth in the public notice.

ATTACHMENT 1

PERMIT NO. HI 0021799

**AUTHORIZATION TO DISCHARGE UNDER THE
NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM**

In compliance with the provisions of the Clean Water Act, as amended, (33 U.S.C. 1251 *et. seq.*; the "Act") and Chapter 342D, Hawaii Revised Statutes, and Chapters 11-54 and 11-55, Administrative Rules, Department of Health, State of Hawaii,

**U.S. ARMY CORPS OF ENGINEERS
U.S. ARMY ENGINEER DISTRICT, HONOLULU**

(hereinafter "PERMITTEE"),

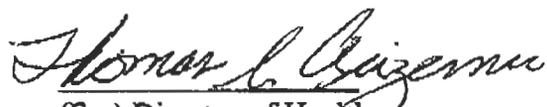
is authorized to discharge storm water associated with the construction activities from the land-based work and storage area for the **Kaunalapau Harbor Breakwater Repair** project, located at Kaunalapau Road, Kaunalapau, island of Lanai, Maui, Hawaii to the receiving State waters, unnamed bay just north of Kaunalapau Harbor, at coordinates: Latitude 20°47'30"N, Longitude 156°59'15"W, in accordance with the general requirements, discharge monitoring requirements, and other conditions set forth herein, and in the attached Department of Health (DOH) "Standard NPDES Permit Conditions," dated December 31, 2002.

All references to Title 40 of the Code of Federal Regulations (CFR) are to regulations that are in effect on July 1, 2001, except as otherwise specified. Unless otherwise specified herein, all terms are defined as provided in the applicable regulations in Title 40 of the CFR.

This permit will become effective the on the date of issuance.

This permit and the authorization to discharge will expire at midnight, May 31, 2007.

Signed this 25th day of July, 2003.


(For) Director of Health

PERMIT ISSUED
July 25, 2003

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PART C. REPORTING REQUIREMENTS

PART D. LOCATION MAP

STANDARD NPDES PERMIT CONDITIONS

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PART A
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Page 3

A. GENERAL REQUIREMENTS:

The Permittee shall:

1. Comply with all materials that was submitted in and as part of the application, dated October 7, 2002, and additional submittals, dated March 14, and 18, 2003, and May 5, 2003.
2. Retain a copy of the application, including other related materials, and this permit at the job site or at a nearby field office.
3. Ensure that anyone working under this permit complies with the terms and conditions of this permit.
4. Take all reasonable steps to minimize or prevent any discharge or disposal of sediments, oil, fuel, pesticides or any other pollutants which will cause or contribute to a violation of this permit or applicable law. Sediments or any other pollutants generated by the construction shall be disposed of in a manner which prevents its entrance into or pollution of any surface or subsurface waters.
5. Obtain all necessary permits, certifications, approvals, etc. from all pertinent agencies for the subject project.
6. Include the file number, HI 0021799, and the following certification with all information required under this permit:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

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PART A
PERMIT NO. HI 0021799
Page 4

7. Submit all information required under this permit to the following address:

Director of Health
Clean Water Branch
Environmental Management Division
State Department of Health
P.O. Box 3378
Honolulu, HI 96801-3378

PERMIT ISSUED
July 25, 2003

PART B
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Page 5

B. DISCHARGE MONITORING REQUIREMENTS:

The Permittee shall:

1. Timely inspect the receiving State waters, discharge effluent, control measures, and Best Management Practices (BMPs) to detect violations of and conditions which may cause or contribute to a violation of the basic water quality criteria as specified in Section 1 of the Standard NPDES Permit Conditions, dated December 31, 2002.
2. Review and update the effectiveness and adequacy of the implemented site-specific BMPs Plan(s) and sediment and erosion control plan(s) as often as necessary. Any change(s) to the site-specific BMPs Plans and/or sediment and erosion control plans or correction(s) to information already on file with the DOH shall be submitted to the Clean Water Branch (CWB) as such change(s) or correction(s) arises.

PERMIT ISSUED
July 25, 2003

PART C
PERMIT NO. HI 0021799
Page 6

C. REPORTING REQUIREMENTS

The Permittee shall:

1. Submit the following information to the DOH for review and comment at least 30 days prior to the commencement of construction activities:
 - (i) Any general contractor's information which was not identified in the submitted information. The information must include the general contractor's legal name, address (location where papers can be hand-delivered), contact person and title, telephone and fax numbers.
 - (ii) A site-specific construction Best Management Practices (BMPs) plan for the land-based work and storage area in accordance with Item 15 of the CWB-NOI Form C (revised/November 20, 2002).
 - (iii) A timetable for major construction activities including the date when the contractor will begin and end site disturbance, and when erosion and sediment control measures will be implemented and removed.

All related concerns and comments shall be properly addressed to the DOH's satisfaction before any discharge occurs.

2. Complete and submit the enclosed Solid Waste Disclosure Form for Construction Sites to the Office of Solid Waste Management as specified on the form.
3. Submit any changes to information on file with the DOH as soon as changes arise. The Permittee shall properly address all related concerns and/or comments to the DOH's satisfaction
4. Notify the DOH upon termination of the discharge activities.

PERMIT ISSUED
July 25, 2003

PART D
PERMIT NO. HI 0021799
Page 7

D. LOCATION MAP

See Attachment A.

07081PGY.03A

PERMIT ISSUED
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PAK 1 D
PERMIT NO. HI 0021799
ATTACHMENT A
PAGE 8

CONTRACTOR WORK AND
STORAGE AREA
(APPROX. 2.3 ACRES)

PROJECT
LOCATION

3-D TopoQuads Copyright © 1999 DeLorme Yonkers, NY 0-8996 Source Data: USGS 750 ft Scale: 1:25,000 Detail: 1:8 Datum: NAD27

TOPOGRAPHIC MAP

SCALE: 1:25000

Source:

M&E Pacific, Inc.
ENGINEERS & ARCHITECTS
SUITE 500, PALUANI TOWER - 1001 BISHOP ST., HONOLULU, HAWAII 96813

FIGURE 2

TOPOGRAPHIC MAP

KAUMALAPAU HARBOR BREAKWATER REPAIR
Prepared By: M&E Pacific, Inc.
OCTOBER 2002

PERMIT ISSUED

July 25, 2003



STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD / CWB

WQC535.FNL

July 15, 2002

Lt. Col. Ronald N. Light
District Engineer
U.S. Army Engineer District, Honolulu
U.S. Army Corps of Engineers
Department of the Army
Building 230
Fort Shafter, Hawaii 96858-5440

The Honorable Brian K. Minaai, Director
State Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Lt. Col. Light and Mr. Minaai:

**Subject: Section 401 Water Quality Certification (WQC) for
Kaunalapau Harbor Breakwater Repair
Island of Lanai, Maui, Hawaii (TMK: 4-9-3: 26)
File No. WQC 0000535**

In accordance with the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et seq.; the "CWA"), Chapters 91, 92, and 342D, Hawaii Revised Statutes (HRS), Part 121 of Title 40, Code of Federal Regulations (CFR), and Chapter 11-54 of the Hawaii Administrative Rules (HAR), the Department of Health (Department) has reviewed your WQC application and appurtenant data relevant to water quality considerations for the discharge activities. The discharges resulting from the subject construction activity shall comply with applicable requirements specified in CWA, Section 404, and Section 10 of the Rivers and Harbors Act (RHA) of 1899. The processing of the subject WQC application and the issuance of this Section 401 WQC is based on the "Memorandum of Agreement" between the Honolulu Engineer District (HED) of the U.S. Army Corps of Engineers (COE) and the Department's Clean Water Branch (CWB), dated January 7, 1997.

Applicants: (1) U.S. Army Engineer District, Honolulu
U.S. Army Corps of Engineers (COE)
Department of the Army
Building 230
Fort Shafter, Hawaii 96858-5440

ATTACHMENT 2

Lt. Col. Ronald N. Light
The Honorable Brian K. Minaai
July 15, 2002
Page 2

Contact: LTC Ronald N. Light, District Engineer
Phone: (808) 438-1069

(2) Department of Transportation (DOT)
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813

Contact: Mr. Brian K. Minaai, Director
Phone: (808) 587-2150

The Director of Health (Director) attests to the following statements based on information contained in the WQC application package.

1. The Director has either:
 - a. Examined the application submitted by the HED and State Department of Transportation (DOT) and bases its certification upon an evaluation of the information contained in such application which is relevant to water quality considerations; or
 - b. Examined other information furnished by the HED and DOT sufficient to permit the statement described in Item No. 2. below.
2. With the conditions imposed in Item 3. below, there is a reasonable assurance that the activity will be conducted in a manner which will not violate the Basic Water Quality Criteria applicable to all waters and the Specific Water Quality Criteria applicable to the class of State waters where the proposed discharge(s) would take place.
3. The following conditions are deemed necessary to be imposed with respect to the subject HED's Civil Works construction project, subject to the compliance with all applicable procedures, guidelines, restrictions, and regulations required under the authorization of CWA, Section 404, and RHA, Section 10:
 - a. The discharges evaluated under this application are those which would be the result from the proposed breakwater construction activity.
 - b. Materials to be temporarily or permanently placed into the Kaumalapau Boat evaluated under this WQC application are those necessary for or related to the construction of the proposed breakwater which include, approximately, the:

(1) Permanent placement of:

	<u>Total</u> <u>Volume</u>	<u>Above</u> <u>MHHW</u>	<u>Below</u> <u>MHHW</u>
(a) Shaping of Existing Breakwater	31,800 cy	3,800 cy	28,000 cy
(b) Core Stone (3-4 ton)	1,200 cy	0 cy	1,200 cy
(c) Bedding Stone (400 to 800 lb)	90 cy	0 cy	90 cy
(d) Underlayer Stone (3-4 ton)	15,000 cy	2,250 cy	12,750 cy
(e) Concrete Armor Units (650 units at 35 ton each)	11,622 cy	2,900 cy	8,722 cy
(f) Concrete Rib Cap	900 cy	900 cy	0 cy
(g) Geotextile Filter Fabric	9,300 sf	0 sf	9,300 sf
(h) Tremie Concrete	130 cy	0 cy	130 cy

*(cy-cubic yards - sf-square feet)

(2) Temporary placement of:

- (a) Silt containment devices.
- (b) Marker floats.
- (c) Equipment anchors etc.

as necessary for the construction and protection of the marine environment.

c. This WQC:

(1) Shall become effective when:

CC

- (a) A complete Environmental Protection Plan (EPP), as required in Section 014~~30~~ of the "Technical Specifications" (dated June 2001) has been submitted to the CWB for review and comment. The EPP shall also include a site-specific Best Management Practices (BMPs) plan.

The Site-Specific BMPs plan shall be designed, implemented, operated, and maintained by the HED and DOT in a manner to properly isolate and confine the construction activity(ies) and to contain and prevent any potential pollutant(s) discharges from adversely impacting the State waters.

The site-specific BMPs plan, at a minimum, shall include: site characterization; construction sequence; construction method; characteristics of the discharge and potential pollutants associated with the

proposed construction activity; and proposed control measures and/or treatment.

The site-specific BMPs plan shall also include a detailed Temporary Construction and Restoration Plan (Plan) if temporary construction activities such as the construction of erosion control measures, temporary construction access, staging and storage areas, desilting and/or dewatering basins, or any other similar activities that are needed for the project construction. The Plan shall include typical section, location, and material to be used for the temporary structures, duration the temporary structures are to be left in State waters and/or on land, Best Management Practices and/or mitigation measures to be used for the construction and removal of the temporary structures, color photographs taken at all disturbed areas (including both upland and aquatic environment) before and after the proposed construction activities, information on the physical, chemical, and biological property of the disturbed areas, methods to be used to restore the disturbed areas, and methods to be used to determine the adequacy of the restoration activity. If restoring the site to its preconstruction condition is impractical or impossible, a written justification and the detailed disturbed site stabilization plan acceptable to the site/project owner, as appropriate, shall be submitted for review and comment;

- CC (b) The HED and DOT submitted to the CWB an acceptable written Quality Assurance (QA) and Quality Control (QC) protocol as required in the Water Quality Monitoring Plan (WQMP), dated November 2001;
- CO (c) The HED and DOT submitted to the CWB the final construction drawings; and
- CO/CC (d) The HED and DOT receive a written acceptance of the submitted site-specific BMPs plan and the QA/QC protocol for the WQMP from the Director and after all related concern(s) and comment(s) are properly addressed to the Director's satisfaction. The Director shall have 30 days to review the information and provide comments and concerns, if any.
- CO (2) Shall expire two (2) years from the effective date of the WQC, or until the applicable State Water Quality Standards (WQS) are revised or modified, or when the project construction is completed, whichever is earliest. If the applicable WQS is revised or modified during the two-year period and the

activity complies with the revisions or modifications, this WQC shall continue to be valid for the remainder of the two-year period.

The Director may, upon the written request from HED or DOT, administratively extend the expiration date of this WQC if the written request can demonstrate to the Director that there are no significant changes to the project scope and the changes will not, either individually or cumulatively, cause adverse impact to the receiving water quality.

(3) May be revoked when any of the following are identified:

CO/CC

(a) WQS applicable to the waters into which the activity may discharge are subsequently established before the activity is completed and the discharges from the construction activity are violating the new WQS. The Director will notify the HED and DOT of the violation. The HED and DOT shall cease the violation within 180 days of the date of the notice. If the HED and DOT fail within 180 days of the date of the notice to cease the violation, the Director may revoke this certification at the Director's discretion; or

CO/CC

(b) Discharge(s) from the activity violate the existing WQS or any condition of this WQC. The Director will notify the HED and DOT of the violation. The HED and DOT shall cease the violation within seven (7) days of the date of the notice. If the HED and DOT fail within seven (7) days of the date of the notice to cease the violation, the Director may revoke this certification at the Director's discretion.

These actions shall not preclude the Department from taking other enforcement action authorized by law.

Written notification by the Director under this section is complete upon mailing or sending a facsimile transmission of the document or actual receipt of the document by HED and/or DOT.

d. The HED and DOT shall:

CO

(1) Invite the Department's representative(s) to attend the partnering, pre-construction or any other similar type of meeting that is established for the proposed construction project.

CO

(2) Submit information on the selected general contractor. Information shall, at a minimum, include the general contractor's legal name, address, contact person's

name and position, telephone and fax numbers, to the CWB together with the submittal of the above required site-specific BMPs plan

- CC (3) Provide the name and two (2) telephone numbers of at least two (2) persons who may be contacted in case of emergency regarding "discharges" into the State waters.
- CO (4) Submit the Final Environmental Assessment once it becomes available.
- CC (5) Notify the Department [via telephone number (808) 586-4309] and Maui District Health Office [via telephone number (808) 984-8234] at least three (3) working days before any work is to begin.
- CO (6) Notify the CWB within 14 days after the completion of the proposed construction activities (including the disturbed sites restoration activities).
- CC (7) Comply, and shall also require the contractor(s) to comply, with the notification, technical specifications, Environmental Protection Plan, accepted site-specific BMPs plan [as required in item 3.c(1)], the WQMP (dated November 2001), applicable Mitigation and/or Compensation Plan (if any), and any other project-related information or requirements submitted to the Department with the WQC application or subsequently transmitted to and deemed acceptable by the Department after the issuance date of this WQC.
- CC (8) Properly conduct or contract with a qualified laboratory/environmental consultant to conduct applicable monitoring and assessment in accordance with the WQMP (dated November 2001) and the acceptable QA/QC protocol as required in Item 3.c(1)].

Test methods promulgated in 40 CFR Part 136 effective on July 1, 1998, and, when applicable, the chemical methodology for sea water analyses (see HAR, Section 11-54-10) shall be used. The detection limits of the test methods used shall be equal to or lower than the applicable water quality standards as specified in HAR, Chapter 11-54. For situations where the applicable water quality standard is below the detection limits of the available test methods, the test method which has the detection limit closest to the applicable water quality standards shall be used. If a test method has not been promulgated for a particular parameter, the applicant may submit an application through the Director for approval of an alternate test procedure by following 40 CFR §136.4.

The Director may, at the Director's own discretion or upon written request from the HED or DOT and on a case-by-case basis, require the HED and DOT to modify the monitoring frequency(ies) or change the sampling locations, as appropriate. If a written request is submitted for the reduction of monitoring frequency(ies), it shall be accompanied by an assessment of monitoring results which shall clearly demonstrate that the project construction activity related discharge has fully complied with the applicable water quality standards.

The HED and DOT shall conduct post-construction receiving water chemistry monitoring as required in the Department's "General Monitoring Guideline for Section 401 Water Quality Certification Projects" unless otherwise waived by the Director in writing.

- CC (9) Forward all monitoring results to the CWB as soon as they become available or as otherwise specified in the acceptable WQMP. Field data shall be forwarded to the CWB by fax the same day of the sampling.
- CC (10) Ensure that silt curtain(s) or other appropriate and effective silt containment device(s): be properly deployed prior to the commencement of any in-water construction work; be properly maintained throughout the entire period of the in-water construction work; and not be removed until the in-water work is completed and the water quality in the affected area has returned to its pre-construction condition as demonstrated by the monitoring results.
- CC (11) Ensure that all activity-related discharges be conducted in a manner that complies with the "Basic Water Quality Criteria Applicable to All Waters" as specified in HAR, Section 11-54-4.
- CC (12) Ensure that all material(s) placed or to be placed in State waters be free of waste metal products, organic materials, debris, and any pollutants at toxic or potentially hazardous concentrations to aquatic life as identified in HAR, Subsection 11-54-4(b).
- CC (13) Ensure that construction debris be contained and prevented from entering or re-entering State waters.
- CC (14) Immediately cease the portion of the construction work which is causing or may cause noncompliance with HAR, Subsection 11-54-4(a) or Subsection 11-54-4(b) or the portion of the construction is damaging or will cause damage to the aquatic environment as is indicated through water quality monitoring results or during the daily inspection or observations. The

construction activity shall not resume until adequate mitigative measures are implemented and appropriate corrective actions are taken and approved by the Director. The HED and DOT shall not hold the Department responsible for any damages or costs incurred due to the cessation of the construction works.

- CC (15) Immediately report any spill(s) or other contamination(s) that occurs at the project site to the CWB.
- CC (16) Ensure that all temporarily constructed facilities or structures will be removed immediately after the completion of the in-water construction.
- CC (17) Allow the Department's representative(s) to make periodic inspections in accordance with HRS, Section 342D-8.
- CC (18) Discontinue the work during flood conditions.
- CC (19) Hold clearing and grubbing work to a minimum.
- CC (20) Ensure that:
 - (a) Erosion and sediment control measures be in place and functional before earth moving operations begin;
 - (b) Temporary soil stabilization be applied on areas that will remain unfinished for more than 30 calendar days; and
 - (c) Permanent soil stabilization be applied as soon as practicable after final grading.

- cc/cc e. The HED and DOT shall review and update the effectiveness and adequacy of the WQMP (including the QA/QC protocol), the implemented Best Management Practices, and/or environmental protection measures as often as needed. The HED and DOT shall modify the WQMP, Best Management Practices, and/or environmental protection measures upon request or when instructed by the Director. Any change(s) to the accepted site-specific BMPs plan or WQMP or correction(s) or modification(s) to information already on file with the Department shall be submitted to the CWB, for review and comment, as such change(s), correction(s) or modification(s) arise. The HED and DOT shall properly address all comment(s) and/or concern(s) to the Director's satisfaction before such change(s), correction(s) or modification(s) become effective.

Lt. Col. Ronald N. Light
The Honorable Brian K. Minaai
July 15, 2002
Page 9

- cc
- f. The HED and DOT shall ensure that all demolition debris and/or dredged/excavated materials will be properly removed from the aquatic environment and be disposed of at an upland Federal, State or County approved site(s). A Solid Waste Disclosure Form for Construction Sites shall be completed and returned to the Department's Office of Solid Waste Management. No construction material or construction-related materials shall be stockpiled, stored or placed in the aquatic environment, or stored or placed in ways that will disturb the aquatic environment.
- CO
- g. The HED and DOT shall obtain a National Pollutant Discharge Elimination System permit for any discharge(s) that is regulated pursuant to CWA, Section 402, and HAR, Chapter 11-55.
- CO/CC
- h. The HED and DOT shall comply with all new State WQS adopted by the Department after the effective date of this WQC.

The HED and DOT have published a Notice of Proposed Section 401 WQC in The Maui News on May 20, 2002 for the subject activity.

After consideration of the expressed views of all interested persons and agencies and pertinent State statutes and rules, the Department hereby issues this WQC to the HED and DOT for the subject breakwater construction at Kaunalapau Harbor and Manele Bay.

Please include File No. **WQC 0000535** and the following certification in all future correspondences with the Department regarding the subject project:

cc

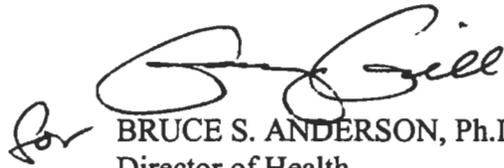
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Failure to provide the File No. **WQC 0000535** assigned to this project in any future correspondence or inquiry may be a basis to delay the processing of your correspondence.

Lt. Col. Ronald N. Light
The Honorable Brian K. Minaai
July 15, 2002
Page 10

Enclosed are two original copies of the Section 401 WQC. Please sign and date one and return it to the CWB. Should you have any questions, please contact Mr. Edward Chen of the Engineering Section, CWB, at (808) 586-4309.

Sincerely,


for BRUCE S. ANDERSON, Ph.D., M.P.H.
Director of Health

Enclosure

- c: State DBEDT, CZM Program (w/o encl.)
- State DOT, Harbors Division (w/o encl.)
- State DOH, SHWB (w/o encl.)
- DHO, Maui (w/o encl.)
- Chief, DEHP, Maui (w/o encl.)
- EHS, Molokai/Lanai (w/o encl.)
- Mr. Ricki Hokama (w/o encl.)

WE AGREE WITH THE TERMS AND CONDITIONS OF THIS LETTER:



HONOLULU DISTRICT ENGINEER
U.S. ARMY CORPS OF ENGINEERS



DATE



DIRECTOR, DEPARTMENT OF
TRANSPORTATION



DATE

CC

**Water Quality Monitoring Plan
Kaumalapau Harbor Breakwater Repair
Island of Lana`i, Hawaii**

Department of the Army
U.S. Army Engineer District, Honolulu
November 2001

1. PROJECT LOCATION AND GENERAL DESCRIPTION

Kaumalapau Harbor is a small barge harbor located in a natural embayment on the southwest coast of Lana`i. The harbor has a 10-acre berthing area, and water depths between 20 and 60 feet. Shoreside facilities along the north side of the embayment consist of a 400-foot-long wharf, a cargo shed and barge loading and unloading equipment. A breakwater extending to the south from the northwestern side of the embayment protects the wharf area. The existing breakwater has been badly damaged by storm waves, and in its deteriorated condition allows increased wave energy to enter the harbor. The Kaumalapau Harbor breakwater repair project will rebuild the damaged breakwater in order to provide improved berthing conditions at the wharf for cargo and fuel delivery to the island. Repairs will consist of re-shaping the existing breakwater to provide a core for the new structure, and placement of an underlayer of 3 to 4 ton stone and an armor layer of 35-ton concrete armor units. In-water work is estimated to take approximately 18 months.

2. GENERAL SCOPE OF WORK

The purpose of the work is to conduct marine water sampling and analysis in the vicinity of the proposed Kaumalapau Harbor breakwater repair project. The water sampling and testing will be performed by the construction contractor (Contractor) to monitor specific water quality parameters pre, during, and, if necessary, post construction. The number of samples to be collected, frequency of collection, and the specific analyses to be performed shall be in accordance with the State of Hawaii, Department of Health, "General Monitoring Guideline for Section 401 Water Quality Certification Projects" (WQC Matrix) (Attachment 1 and Reference 4). The water quality sampling and testing results, and the Contractor's evaluation of compliance with State water quality standards for each sampling day during construction, shall be transmitted in the form of a brief written laboratory report to the Government Contracting Officer and the State Department of Health, Clean Water Branch (DOH/CWB) as soon as they become available. All field data and laboratory analysis shall be fully described and evaluated in a final summary report by the Contractor to the Contracting Officer which can be used to document compliance or non-compliance with State water quality standards (Reference 1).

ATTACHMENT 3

Major work tasks include the following:

- a. coordinate with the Contracting Officer,
- b. establish appropriate quality control and quality assurance procedures,
- c. collect samples and associated field data,
- d. analyze samples for specified parameters, and
- e. prepare and submit reports.

The intent of the Water Quality Monitoring Plan is: 1) to ascertain that the Best Management Practices (BMP's) for the project are adequate to comply with State Water Quality Standards; 2) in the event that the BMP's prove inadequate, to promptly determine such, so that modifications of the BMP's can be implemented in a timely manner to bring the activity into compliance; and 3) to serve as a basis for self-compliance, so that activities associated with the proposed action can proceed within the parameters required by State water quality standards.

3. WORK TASK DETAILS

a. Coordinate with the Contracting Officer. The Contractor shall coordinate with the Contracting Officer to gather project information, provide schedules and points of contact, resolve contract difficulties, attend conferences, provide work status reports, and to assure timely and appropriate scheduling and completion of each of the sampling phases (pre-construction, during construction and post-construction).

b. Establish Appropriate Quality Control (QC) and Quality Assurance (QA) Procedures. The Contractor shall establish appropriate QC and QA procedures for this work. The QC/QA shall cover sample collection, preparation and transport, lab analysis and reporting of data. The QC/QA procedures shall be described in a written plan, which shall be submitted in writing to the Contracting Officer for approval and DOH/CWB for review and acceptance prior to the initiation of sampling.

c. Collect Samples and Associated Field Data. A set of water samples shall be collected by the Contractor at the five (5) stations shown on Figure 1, at the frequency specified in the WQC Matrix (Attachment 1). The samples shall be taken at the approximate mid-water depth at each station. The location of each sampling station shall be located and mapped. The collection of samples at each station shall be performed consistently with respect to location and depth, so that individual samples and sample sets represent replicates suitable for statistical analysis. Tide stage, weather conditions, wave action, wind direction and construction activity during collection of the water samples shall be recorded. Sample containers, preservation, and maximum holding times shall be as specified in 40 CFR Part 136 (Reference 2). Samples shall be collected during daylight hours, during hours of work, and at least three hours after work has commenced for the day. Sampling shall also be conducted on random days without prior notification in order to be representative so far as practicable of typical construction activities. In addition to the five regular sampling stations, a water sample shall be taken immediately outside of any silt curtains deployed around areas of active construction. The sample

shall be taken downdrift of wind or current induced water movement, within 3 feet of the outboard side of the silt curtain, and within 1-foot of the water surface.

d. **Analyze Samples for Specified Parameters.** The Contractor shall analyze all field samples for pH, turbidity and total suspended solids (TSS). Analyses shall be done in accord with the methods specified in Federal regulations at 40 CFR Part 136 (Reference 2), or, where this is lacking in information, then according to the methods contained in "Standard Methods for the Examination of Water and Wastewater" (Reference 3). Analysis shall include any necessary instrument calibration, analysis of laboratory blanks, quality control samples, or other mandates of the specified methods. All samples must be analyzed within the relevant maximum holding times stated in Table II of 40 CFR Part 136. The Contractor may substitute other methods only with prior approval of the Contracting Officer. In addition to the basic water quality parameters, during periods of excavation and reshaping of the existing breakwater, excavation of the toe trench, or tremie concrete placement in the water, the Contractor shall measure dissolved oxygen, salinity and temperature at each regular and silt screen sampling station.

e. **Prepare and Submit Reports.** The Contractor shall provide (1) preliminary laboratory reports (when requested by the Contracting Officer), (2) written laboratory reports, and (3) a final written summary report.

(1) Preliminary laboratory reports may be requested by the Contracting Officer. These shall be furnished at no additional charge, and may be given verbally (via telephone) or by facsimile transmission. Preliminary reports are acknowledged to be tentative, subject to confirmation or change.

(2) A brief (approximately 1-2 pages) written laboratory report shall be prepared for each sample day. Each of these reports shall list the project name, the date of sample collection, the date of analysis, the name of the laboratory/person performing the analysis, a brief statement concerning the observed degree of compliance or noncompliance with State water quality standards (Reference 1) as indicated by the analysis results and associated field data (and the apparent reason(s), if known, for any observed violations), the date of the report, and the signature of the preparer. The analysis results for each sample shall be tabulated and shall include project name, sample number, station number, subsurface depth of sample, time of collection, analyzed amount and unit of measure, and any relevant associated data or observations. In reaching conclusions concerning the degree of compliance with the State water quality standards and cause(s) of apparent violations, the Contractor shall conduct and consider the results of appropriate quantitative comparisons between the current field data obtained from project site monitoring stations and from control stations, and between the current data and baseline data provided by the Contracting Officer. The methods to be used in conducting such comparisons shall include generally accepted statistical methods or other methods selected by the investigator to be those which in his professional

judgment are most appropriate for the purpose of ascertaining degree of compliance with the water quality standards. The method(s) used and results considered shall be described. Reports including during construction sampling results shall be sent to the Contracting Officer and DOH/CWB within 24 hours of completion of laboratory analysis.

- (3) A written final summary report shall be prepared which fully describes the results of sampling and analysis. This report shall, at the least, contain the following information.
 - a) An introduction, which includes a statement of purpose and objectives and a brief description of the study design, including a figure or figures to show the project location and the location of the sampling stations, relative to existing features and the construction project site.
 - b) A description of the methods employed in collecting, transporting, and analyzing the water samples.
 - c) Copies of all analysis reports (these may be placed in an appendix of the summary report).
 - d) A discussion summarizing results of the sampling and analysis. Presentation of the results shall include tabular and graphical presentations of the data, including statistical analysis where appropriate.
 - e) Summary conclusions regarding the degree of compliance or noncompliance with State water quality standards (Reference 1), and the probable cause(s) of any violations.

One unbound original of the final written summary report, on standard-size (8.5x11 inch) paper and suitable for photocopying, and 4 bound copies of the report shall be submitted to the Contracting Officer within 30 days of the completion of the analysis of the last water samples taken.

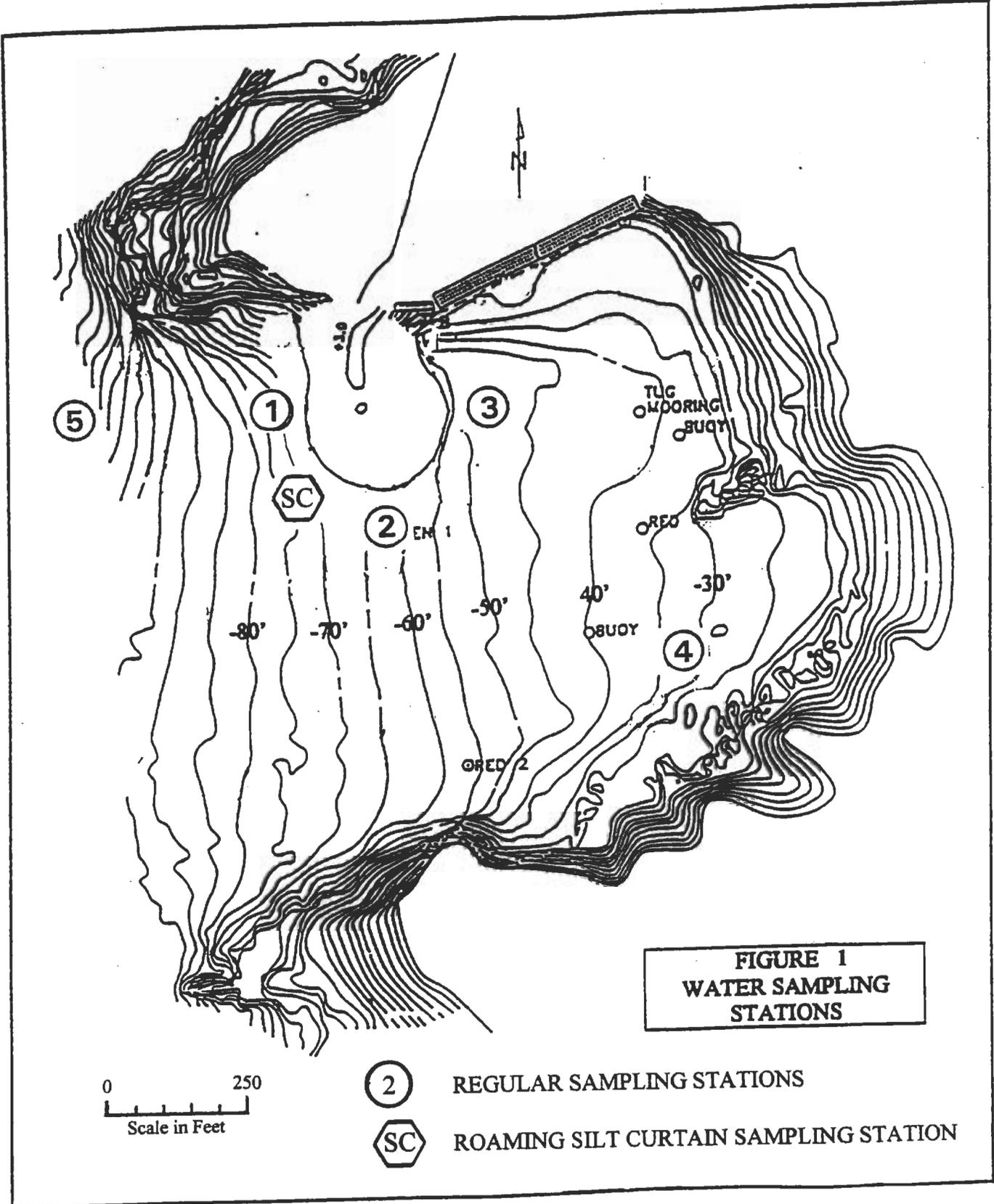
4. SPECIAL CONDITIONS

- a. The Contractor shall designate a specific water quality principal investigator (PI) who can demonstrate training and knowledge in the sampling and analysis methodology which will be used in the conduct of this work. The PI, as well as the sampling and analysis methodology to be used, shall be submitted to the Contracting Officer for approval prior to the initiation of water quality monitoring. The PI and the methodology shall also be acceptable to the State of Hawaii, Department of Health. Any change in the PI must be approved by the Contracting Officer.
- b. The Contractor shall be responsible for the accuracy and validity of the data obtained in accomplishing this work. The Contractor, without additional cost or fee to the Government, shall correct errors or deficiencies in performance.

- c. The Contractor shall make his sample storage and analysis facilities, as well as all records relating to this work, available for inspection by the Contracting Officer upon request.
- d. In the event the Contracting Officer has need for expert written opinion or testimony on data or reports furnished under this contract in conjunction with administrative or judicial proceedings, the Contractor shall furnish experts to provide such testimony, or attend meetings/conferences in this regard. If so required, modification to this contract will be negotiated to include appropriate terms and conditions.
- e. All monitoring work shall be undertaken in accordance with OSHA standards and applicable federal, state and county regulations, and the safety provisions of Department of the Army Manual EM385-1-1.
- f. All materials, transportation, and equipment used in the conduct of this work shall be furnished by the Contractor.
- g. Any conflicts detected in any of the information furnished shall be brought to the attention of the Contracting Officer for resolution before proceeding with the work.
- h. The information developed, gathered and assembled in fulfillment of the contract requirements shall not be released, except to the DOH/CWB, by the Contractor, his consultants or subcontractors, without prior approval by the Contracting Officer. The information shall become the property of the Government and shall, therefore, not be used by the Contractor for any purpose at any time without the written consent of the Contracting Officer.

5. REFERENCES

1. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 54, Water Quality Standards
2. Code of Federal Regulations (CFR), Title 40, Chapter 1 (EPA), Part 136 – Guidelines Establishing Test Procedures for the Analysis of Pollutants.
3. American Public Health Association. 1989. Standard Methods for the Examination of Water and Wastewater, 20th Edition.
4. State of Hawaii, Department of Health. April 7, 2000. General Monitoring Guideline for Section 401 Water Quality Certification Projects.



**FIGURE 1
WATER SAMPLING
STATIONS**

0 250
Scale in Feet

2

REGULAR SAMPLING STATIONS

SC

ROAMING SILT CURTAIN SAMPLING STATION

General Monitoring Guideline for Section 401 Water Quality Certification Projects

Period of Construction Project	<1 to 4 Months					≥5 Months to ≤4 Year					Construction Project Monitoring Frequency*		
	≤1	>1	2	3	4	≥5	1	2	3	≤4	Pre-	During	Post
Parameter to Monitor for "X" Months of "In-Water" Work													
Photo Documentation	✓										✓	✓	✓
pH	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Turbidity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Total Suspended Solids (TSS)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Dissolved Oxygen (DO)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Salinity	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Temperature	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Secchi Disc or Light Extinction	○	○	○	○	○	○	○	○	○	○	○	○	○
Biological Monitoring	×	×	×	×	×	×	×	×	×	×	×	×	×
Nitrate + Nitrite Nitrogen (NO ₃ ,NO ₂)	○	○	○	○	○	○	○	○	○	○	○	○	○
Total Kjeldahl Nitrogen (TKN)	○	○	○	○	○	○	○	○	○	○	○	○	○
Ammonia Nitrogen (NH ₄)	○	○	○	○	○	○	○	○	○	○	○	○	○
Total Nitrogen (TN)	○	○	○	○	○	○	○	○	○	○	○	○	○
Ortho-Phosphate (PO ₄)	○	○	○	○	○	○	○	○	○	○	○	○	○
Total Phosphorus (TP)	○	○	○	○	○	○	○	○	○	○	○	○	○
Chlorophyll <i>a</i>	○	○	○	○	○	○	○	○	○	○	○	○	○
Silicate	○	○	○	○	○	○	○	○	○	○	○	○	○
Pesticides, PAHs, metals, etc.	○	○	○	○	○	○	○	○	○	○	○	○	○
Other													
Monitoring Frequency	D	D	D	3W	3W	3W	2M	M	Q	Q	*	**	***

Symbol Legend	
✓	Basic water quality monitoring parameters
✓	Included with dredging projects, if no habitat loss or modification
○	Optional per data evaluation suggesting no significant impact
○	Optional per dredging projects
○	Photo documentation on dredging project with some habitat loss or modification
×	Bio-monitoring on dredging projects with habitat loss or modification
○	To be determined on individual case
○	Optional per individual cases for dredging projects

Notes:

* Pre-construction sampling for TSS and Turbidity of TEN samples over TWO weeks for projects that impact bottom sediment.

** During construction monitoring is limited to length of "in-water" work period.

*** Post-construction monitoring is limited to once per construction period.

Shaded blocks represent basic or minimum requirement for most projects.

D = Daily
 W = Weekly
 M = Monthly
 Q = Quarterly
 (i.e., 3W = three times per week)

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SECTION 01451

CONTRACTOR QUALITY CONTROL

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3740 (1996) Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

ASTM E 329 (1995b) Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction

1.2 DEFINITION

The Contractor is responsible for quality control and shall establish and maintain an effective quality control program in compliance with the Contract Clause titled "Inspection of Construction." The quality control program shall consist of plans, procedures, and organization necessary to produce an end product that complies with the contract requirements. The program shall cover all construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. The following shall be submitted in accordance with section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan; G.

1.4 PAYMENT

Separate payment will not be made for providing and maintaining an

effective Quality Control program, and all costs associated therewith shall be included in the applicable unit prices or lump-sum prices contained in the Bidding Schedule.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 GENERAL

The project superintendent will be held responsible for the quality of work on the job and is subject to removal by the Contracting Officer for non-compliance with quality requirements specified in the contract. The project superintendent in this context shall mean the individual with the responsibility for the overall management of the project including quality and production.

3.1.1 Project Superintendent

The Project Superintendent shall have a minimum of ten (10) years experience constructing rock or concrete rubble mound structures in marine environments. The superintendent shall be assigned no other duties.

3.2 QUALITY CONTROL PLAN

3.2.1 General

The Contractor shall furnish for review by the Government, not later than 30 days after receipt of notice to proceed, the Contractor Quality Control (CQC) Plan proposed to implement the requirements of the Contract Clause titled "Inspection of Construction." The plan shall identify personnel, procedures, control, instructions, test, records, and forms to be used. The Government will consider an interim plan for the first 90 days of operation. Construction will be permitted to begin only after acceptance of the CQC Plan or acceptance of an interim plan applicable to the particular feature of work to be started. Work outside of the features of work included in an accepted interim plan will not be permitted to begin until acceptance of a CQC Plan or another interim plan containing the additional features of work to be started.

3.2.2 Content of the CQC Plan

The CQC Plan shall include, as a minimum, the following to cover all construction operations, both onsite and offsite, including work by subcontractors, fabricators, suppliers, and purchasing agents:

- a. A description of the quality control organization, including a chart showing lines of authority and acknowledgment that the CQC staff shall implement the three phase control system for all aspects of the work specified. The staff shall include a CQC System Manager who shall report to the project superintendent.
- b. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a CQC

function. Technicians responsible for sampling and testing of concrete shall be certified by the American Concrete Institute (ACI) or the Concrete Technicians Association of Hawaii (CTAH). Proof of certification shall be included in the CQC Plan. Personnel qualifications may be furnished incrementally as the work progresses, but in no case, less than fourteen (14) calendar days before personnel are required on the job.

- c. A copy of the letter to the CQC System Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the CQC System Manager, including authority to stop work which is not in compliance with the contract. The CQC System Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Government.
- d. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of subcontractors, offsite fabricators, suppliers, and purchasing agents. These procedures shall be in accordance with Section 01330 SUBMITTAL PROCEDURES.
- e. Control, verification, and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency, and person responsible for each test.
- f. For all proposed QC materials testing laboratories, the contractor must submit a current HED or MTC letter of validation.
- g. Procedures for tracking preparatory, initial, and follow-up control phases and control, verification, and acceptance tests including documentataion.
- h. Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures shall establish verification that identified deficiencies have been corrected.
- i. Reporting procedures, including proposed reporting formats.
- j. A list of the definable features of work. A definable feature of work is a task which is separate and distinct from other tasks, has separate control requirements, and may be identified by different trades or disciplines, or it may be work by the same trade in a different environment. Although each section of the specifications may generally be considered as a definable feature of work, there are frequently more than one definable features under a particular section. This list will be agreed upon during the coordination meeting.

3.2.3 Acceptance of Plan

Acceptance of the Contractor's plan is required prior to the start of construction. Acceptance is conditional and will be predicated on satisfactory performance during the construction. The Government reserves the right to require the Contractor to make changes in his CQC Plan and operations including removal of personnel, as necessary, to obtain the quality specified.

3.2.4 Notification of Changes

After acceptance of the CQC Plan, the Contractor shall notify the Contracting Officer in writing of any proposed change. Proposed changes are subject to acceptance by the Contracting Officer.

3.3 COORDINATION MEETING

After the Preconstruction Conference, before start of construction, and prior to acceptance by the Government of the CQC Plan, the Contractor shall meet with the Contracting Officer or Authorized Representative and discuss the Contractor's quality control system. The CQC Plan shall be submitted for review a minimum of 7 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the CQC operations, control activities, testing, administration of the system for both onsite and offsite work, and the interrelationship of Contractor's Management and control with the Government's Quality Assurance. Minutes of the meeting shall be prepared by the Government and signed by both the Contractor and the Contracting Officer. The minutes shall become a part of the contract file. There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the CQC system or procedures which may require corrective action by the Contractor.

3.4 QUALITY CONTROL ORGANIZATION

3.4.1 General

The requirements for the CQC organization are a CQC System Manager and sufficient number of additional qualified personnel to ensure contract compliance. The Safety and Health Manager shall receive direction and authority from the CQC System Manager and shall serve as a member of the CQC staff. Personnel identified in the technical provisions as requiring specialized skills to assure the required work is being performed properly will also be included as par of the CQC organization. The Contractor's CQC staff shall maintain a presence at the site at all times during progress of the work and have complete authority and responsibility to take any action necessary to ensure contract compliance. The CQC staff shall be subject to acceptance by the Contracting Officer.

The Contractor shall provide adequate office space, filing systems and other resources as necessary to maintain an effective and fully functional CQC organization. Complete records of all letters, material submittals, shop drawing submittals, schedules and all other project documentation

shall be promptly furnished to the CQC organization by the Contractor. The CQC organization shall be responsible to maintain these documents and records at the site at all times, except as otherwise acceptable to the Contracting Officer.

3.4.2 CQC System Manager

The Contractor shall identify as CQC System Manager an individual within the onsite work organization who shall be responsible for overall management of CQC and have the authority to act in all CQC matters for the Contractor. The CQC System Manager shall be a construction person with a minimum of 5 years in related work. This CQC System Manager shall be on the site at all times during construction and shall be employed by the prime Contractor. **The CQC System Manager shall be assigned as System Manager, and cannot have duties as project superintendent but may have duties as Site Safety Health Officer (SSHO) in addition to quality control.**

An alternate for the CQC System Manager shall be identified in the plan to serve in the event of the System Manager's absence. The requirement for the alternate shall be the same as for the designated CQC Systems Manager.

3.4.3 CQC Personnel

In addition to CQC personnel specified elsewhere in the contract, the Contractor shall provide as part of the CQC organization specialized personnel to assist the CQC System Manager. If it is subsequently determined by the Contracting Officer that the minimum contract CQC requirements are not being met, the Contractor may be required to provide additional staff personnel to the CQC organization at no cost to the Government.

3.4.4 Additional Requirement

The CQC System Manager shall have completed the course entitled "Construction Quality Management For Contractors" within the past 5 years. This course is periodically offered at the General Contractors Association of Hawaii.

3.4.5 Organizational Changes

The Contractor shall maintain the CQC staff at full strength at all times. When it is necessary to make changes to the CQC staff, the Contractor shall revise the CQC Plan to reflect the changes and submit the changes to the Contracting Officer for acceptance.

3.5 SUBMITTALS AND DELIVERABLES

Submittals, if needed, shall be made as specified in Section 01330 SUBMITTAL PROCEDURES. The CQC organization shall be responsible for certifying that all submittals and deliverables are in compliance with the contract requirements. When Section 15950A, Heating, Ventilating and Air Conditioning (HVAC) Control Systems; Section 15951A, Direct Digital Control for HVAC; Section 15990A, Testing, Adjusting, and Balancing of HVAC Systems; or Section 15995A, Commissioning of HVAC Systems, are included in

the contract, the submittals required by those sections shall be coordinated with Section 01330, Submittal Procedures, to ensure adequate time is allowed for each type of submittal required.

3.6 CONTROL

Contractor Quality Control is the means by which the Contractor ensures that the construction, to include that of subcontractors and suppliers, complies with the requirements of the contract. At least three phases of control shall be conducted by the CQC System Manager for each definable feature of work as follows:

3.6.1 Preparatory Phase

This phase shall be performed prior to beginning work on each definable feature of work, after all required plans/documents/materials are approved/accepted, and after copies are at the work site. This phase shall include:

- a. A review of each paragraph of applicable specifications.
- b. A review of the contract drawings.
- c. A check to assure that all materials and/or equipment have been tested, submitted, and approved.
- d. Review of provisions that have been made to provide required control inspection and testing.
- e. Examination of the work area to assure that all required preliminary work has been completed and is in compliance with the contract.
- f. A physical examination of required materials, equipment, and sample work to assure that they are on hand, conform to approved shop drawings or submitted data, and are properly stored.
- g. A review of the appropriate activity hazard analysis to assure safety requirements are met.
- h. Discussion of procedures for controlling quality of the work including repetitive deficiencies. Document construction tolerances and workmanship standards for that feature of work.
- i. A check to ensure that the portion of the plan for the work to be performed has been accepted by the Contracting Officer.
- j. Discussion of the initial control phase.
- k. The Government shall be notified at least 7 days in advance of beginning the preparatory control phase. This phase shall include a meeting conducted by the CQC System Manager and attended by the superintendent, other CQC personnel (as applicable), and the foreman responsible for the definable feature. The results of the

preparatory phase actions shall be documented by separate minutes prepared by the CQC System Manager and attached to the daily CQC report. The Contractor shall instruct applicable workers as to the acceptable level of workmanship required in order to meet contract specifications.

3.6.2 Initial Phase

This phase shall be accomplished at the beginning of a definable feature of work. The following shall be accomplished:

- a. A check of work to ensure that it is in full compliance with contract requirements. Review minutes of the preparatory meeting.
- b. Verify adequacy of controls to ensure full contract compliance. Verify required control inspection and testing.
- c. Establish level of workmanship and verify that it meets minimum acceptable workmanship standards. Compare with required sample panels as appropriate.
- d. Resolve all differences.
- e. Check safety to include compliance with and upgrading of the safety plan and activity hazard analysis. Review the activity analysis with each worker.
- f. The Government shall be notified at least 7 days in advance of beginning the initial phase. Separate minutes of this phase shall be prepared by the CQC System Manager and attached to the daily CQC report. Exact location of initial phase shall be indicated for future reference and comparison with follow-up phases.
- g. The initial phase should be repeated for each new crew to work onsite, or any time acceptable specified quality standards are not being met.

3.6.3 Follow-up Phase

Daily checks shall be performed to assure control activities, including control testing, are providing continued compliance with contract requirements, until completion of the particular feature of work. The checks shall be made a matter of record in the CQC documentation. Final follow-up checks shall be conducted and all deficiencies corrected prior to the start of additional features of work which may be affected by the deficient work. The Contractor shall not build upon nor conceal non-conforming work.

3.6.4 Additional Preparatory and Initial Phases

Additional preparatory and initial phases shall be conducted on the same definable features of work if the quality of on-going work is unacceptable, if there are changes in the applicable CQC staff, onsite production

supervision or work crew, if work on a definable feature is resumed after a substantial period of inactivity, or if other problems develop.

3.7 TESTS

3.7.1 Testing Procedure

The Contractor shall perform specified or required tests to verify that control measures are adequate to provide a product that conforms to contract requirements. Upon request, the Contractor shall furnish to the Government duplicate samples of test specimens for possible testing by the Government. Testing includes operation and/or acceptance tests when specified. The Contractor shall procure the services of a Corps of Engineers approved testing laboratory or establish an approved testing laboratory at the project site. The Contractor shall perform the following activities and record and provide the following data:

- a. Verify that testing procedures comply with contract requirements.
- b. Verify that facilities and testing equipment are available and comply with testing standards.
- c. Check test instrument calibration data against certified standards.
- d. Verify that recording forms and test identification control number system, including all of the test documentation requirements, have been prepared.
- e. Results of all tests taken, both passing and failing tests, shall be recorded on the CQC report for the date taken. Specification paragraph reference, location where tests were taken, and the sequential control number identifying the test shall be given. If approved by the Contracting Officer, actual test reports may be submitted later with a reference to the test number and date taken. An information copy of tests performed by an offsite or commercial test facility shall be provided directly to the Contracting Officer. Failure to submit timely test reports as stated may result in nonpayment for related work performed and disapproval of the test facility for this contract.

3.7.2 Testing Laboratories

3.7.2.1 3.7.2.1 Validation Requirements

Any laboratory used by the Contractor for testing aggregate, concrete, bituminous materials, soils, rock, and other construction materials must possess a current validation letter prior to performance of testing by that laboratory. Validation shall be obtained through the Corps of Engineers Materials Testing Center (MTC) in Vicksburg, MS. Validation may be initiated by completing an Inspection Request Form and questionnaire that are available directly from the MTC or from the MTC website, <http://www.wes.army.mil/SL/MTC/inspection.htm>.

The MTC also maintains a website listing validated laboratories at:

<http://www.wes.army.mil/SL/MTC/ValStatesTbl.htm>.

3.7.2.2 Exception

The validation letters already obtained from HED in 2001 and 2002 will be considered acceptable proof of validation through its expiration date. Upon expiration, laboratories must be revalidated by the MTC, as required above. The validation status of laboratories in Hawaii may be found at: <http://www.poh.usace.army.mil/Construction/LabValidation/labvalidation.html>.

3.7.2.3 Capability Check

The Government reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the contract specifications and to check the laboratory technician's testing procedures and techniques. Laboratories utilized for testing soils, concrete, asphalt, and steel shall meet criteria detailed in ASTM D 3740 and ASTM E 329.

3.7.2.4 Capability Recheck

If the selected laboratory fails the capability check, the Contractor shall reimburse the Government for each succeeding recheck of the laboratory or the checking of a subsequently selected laboratory. Such costs will be deducted from the contract amount due the Contractor.

3.7.3 Onsite Laboratory

The Government reserves the right to utilize the Contractor's control testing laboratory and equipment to make assurance tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Government.

3.7.4 Furnishing or Transportation of Samples for Testing

Costs incidental to the transportation of samples or materials shall be borne by the Contractor. Samples of materials for test verification and acceptance testing by the Government shall be delivered to a testing laboratory on the Island of Oahu, State of Hawaii, designated by the Contracting Officer. Coordination for each specific test, exact delivery location, and dates will be made through the Government field office.

3.8 COMPLETION INSPECTION

3.8.1 Punch-Out Inspection

Near the completion of all work or any increment thereof established by a completion time stated in the Special Clause entitled "Commencement, Prosecution, and Completion of Work," or stated elsewhere in the specifications, the CQC System Manager shall conduct an inspection of the work and develop a punch list of items which do not conform to the approved drawings and specifications. Such a list of deficiencies shall be included in the CQC documentation, as required by paragraph DOCUMENTATION below, and shall include the estimated date by which the deficiencies will be

corrected. The CQC System Manager or staff shall make a second inspection to ascertain that all deficiencies have been corrected. Once this is accomplished, the Contractor shall notify the Government that the facility is ready for the Government Pre-Final inspection.

3.8.2 Pre-Final Inspection

The Government will perform this inspection to verify that the facility is complete and ready to be occupied. The QC Manager shall develop a punch list of items which do not conform to the contract documents. The Government will review the punch list and add to or correct the items listed. The QC Manager shall incorporate Government comments and provide a Pre-Final Punch List. The Contractor's CQC System Manager shall ensure that all items on this list have been corrected before notifying the Government so that a Final inspection with the customer can be scheduled. Any items noted on the Pre-Final inspection shall be corrected in a timely manner. These inspections and any deficiency corrections required by this paragraph shall be accomplished within the time slated for completion of the entire work or any particular increment thereof if the project is divided into increments by separate completion dates.

3.8.3 Final Acceptance Inspection

The Contractor's Quality Control Inspection personnel, plus the superintendent or other primary management person, and the Contracting Officer's Representative shall be in attendance at this inspection. Additional Government personnel including, but not limited to, those from Base/Post Civil Facility Engineer user groups, and major commands may also be in attendance. The final acceptance inspection will be formally scheduled by the Contracting Officer based upon results of the Pre-Final inspection. Notice shall be given to the Contracting Officer at least 14 days prior to the final acceptance inspection and shall include the Contractor's assurance that all specific items previously identified to the Contractor as being unacceptable, along with all remaining work performed under the contract, will be complete and acceptable by the date scheduled for the final acceptance inspection. Failure of the Contractor to have all contract work acceptably complete for this inspection will be cause for the Contracting Officer to bill the Contractor for the Government's additional inspection cost in accordance with the contract clause titled "Inspection of Construction".

3.9 DOCUMENTATION

The Contractor shall maintain current records providing factual evidence that required quality control activities and/or tests have been performed. These records shall include the work of subcontractors and suppliers and shall be prepared using government-provided software, QCS (see Section 01312), that includes, as a minimum, the following information:

- a. Contractor/subcontractor and their area of responsibility.
- b. Operating plant/equipment with hours worked, idle, or down for repair.

- c. Work performed each day, giving location, description, and by whom. When Network Analysis (NAS) is used, identify each phase of work performed each day by NAS activity number.
- d. Test and/or control activities performed with results and references to specifications/drawings requirements. The control phase should be identified (Preparatory, Initial, Follow-up). List deficiencies noted along with corrective action.
- e. Quantity of materials received at the site with statement as to acceptability, storage, and reference to specifications/drawings requirements.
- f. Submittals reviewed, with contract reference, by whom, and action taken.
- g. Off-site surveillance activities, including actions taken.
- h. Job safety evaluations stating what was checked, results, and instructions or corrective actions.
- i. Instructions given/received and conflicts in plans and/or specifications.
- j. Contractor's verification statement.

These records shall indicate a description of trades working on the project; the number of personnel working; weather conditions encountered; and any delays encountered. These records shall cover both conforming and deficient features and shall include a statement that equipment and materials incorporated in the work and workmanship comply with the contract. Unless otherwise directed by the Contracting Officer the original and one copy of these records in report form shall be furnished to the Government daily within 24 hours after the date covered by the report, except that reports need not be submitted for days on which no work is performed. As a minimum, one report shall be prepared and submitted for every 7 days of no work and on the last day of a no work period. All calendar days shall be accounted for throughout the life of the contract. The first report following a day of no work shall be for that day only. Reports shall be signed and dated by the CQC System Manager. The report from the CQC System Manager shall include copies of test reports and copies of reports prepared by all subordinate quality control personnel.

3.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the foregoing requirements. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification. If the Contractor fails or refuses to comply promptly, the Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such stop orders shall be made the subject of claim for extension of time or for excess costs or damages

by the Contractor.

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SECTION 01525

SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 241	(2000) Safeguarding Construction, Alteration, and Demolition Operations
NFPA 51B	(2003) Fire Prevention During Welding, Cutting, and Other Hot Work
NFPA 70	(2002) National Electrical Code

U.S. ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1	(2003) Safety and Health Requirements Manual
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U.S. NATIONAL ARCHIVES AND RECORDS ADMINISTRATION (NARA)

29 CFR 1910.94	Ventilation
29 CFR 1926	Safety and Health Regulations for Construction

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only or as otherwise designated. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Accident Prevention Plan (APP); G

Activity Hazard Analysis (AHA); G

Crane Critical Lift Plan; G

Crane Work Plan; G

Proof of qualification for Crane Operators; G

SD-06 Test Reports

Reports

Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."

Accident Reports

Monthly Exposure Reports

Regulatory Citations and Violations

Crane Reports

1.3 DEFINITIONS

a. Associate Safety Professional (ASP). An individual who is currently certified as an ASP by the Board of Certified Safety Professionals.

b. Certified Construction Health & Safety Technician (CHST). An individual who is currently certified as a CHST by the Board of Certified Safety Professionals.

c. Certified Industrial Hygienist (CIH). An individual who is currently certified as a CIH by the American Board of Industrial Hygiene.

d. Certified Safety Professional (CSP). An individual who is currently certified as a CSP by the Board of Certified Safety Professionals.

e. Certified Safety Trained Supervisor (CSTS). An individual who is currently certified as an STS by the Board of Certified Safety Professionals.

f. Competent Person for Fall Protection. A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as their application and use with related equipment, and has the authority to take prompt corrective measures to eliminate the hazards of falling.

g. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.

h. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).

i. Medical Treatment. Treatment administered by a physician or by registered professional personnel under the standing orders of a

physician. Medical treatment does not include first aid treatment even through provided by a physician or registered personnel.

j. Multi-Employer Work Site (MEWS). A multi-employer work site, as defined by OSHA, is one in which many employers occupy the same site. The Government considers the Prime Contractor to be the "controlling authority" for all work site safety and health of the subcontractors.

k. Operating Envelope. The area surrounding any crane. Inside this "envelope" is the crane, the operator, riggers, rigging gear between the hook and the load, the load and the crane's supporting structure (ground, rail, etc.).

l. Qualified Person for Fall Protection. A person with a recognized degree or professional certificate, extensive knowledge, training and experience in the field of fall protection who is capable of performing design, analysis, and evaluation of fall protection systems and equipment.

m. Recordable Injuries or Illnesses. Any work-related injury or illness that results in:

- (1) Death, regardless of the time between the injury and death, or the length of the illness;
- (2) Days away from work;
- (3) Restricted work;
- (4) Transfer to another job;
- (5) Medical treatment beyond first aid;
- (6) Loss of consciousness; or
- (7) A significant injury or illness diagnosed by a physician or other licensed health care professional, even if it did not result in (1) through (6) above.

n. Site Safety and Health Officer (SSHO). The superintendent or other qualified or competent person who is responsible for the on-site safety and health required for the project. The CQC System Manager (CQCSM) can be the SSHO on this project.

o. Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).

p. "USACE" property and equipment specified in USACE EM 385-1-1 should be interpreted as Government property and equipment.

1.4 REGULATORY REQUIREMENTS

In addition to the detailed requirements included in the provisions of this contract, work performed shall comply with USACE EM 385-1-1, and any

applicable federal, state, and local, laws, ordinances, criteria, rules and regulations. Submit matters of interpretation of standards to the appropriate administrative agency for resolution before starting work. Where the requirements of this specification, applicable laws, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirements shall apply.

1.5 DRUG PREVENTION PROGRAM

Conduct a proactive drug and alcohol use prevention program for all workers, prime and subcontractor, on the site. Ensure that no employee uses illegal drugs or consumes alcohol during work hours. Ensure there are no employees under the influence of drugs or alcohol during work hours. After accidents, collect blood, urine, or saliva specimens and test the injured and involved employees for the influence of drugs and alcohol. A copy of the test shall be made available to the Contracting Officer upon request.

1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

1.6.1 Personnel Qualifications

1.6.1.1 Site Safety and Health Officer (SSHO)

Site Safety and Health Officer (SSHO) shall be provided at the work site at all times to perform safety and occupational health management, surveillance, inspections, and safety enforcement for the Contractor. The SSHO shall meet the following requirements:

Level 3:

- A minimum of 5 years safety work on similar projects.
- 30-hour OSHA construction safety class or equivalent within the last 5 years.
- An average of at least 24 hours of formal safety training each year for the past 5 years.
- Competent person training as needed.

1.6.2 Personnel Duties

1.6.2.1 Site Safety and Health Officer (SSHO)

- a. Conduct daily safety and health inspections and maintain a written log which includes area/operation inspected, date of inspection, identified hazards, recommended corrective actions, estimated and actual dates of corrections. Safety inspection logs shall be attached to the Contractors' daily [quality control] report.
- b. Conduct mishap investigations and complete required reports. Maintain the OSHA Form 300 and Daily Production reports for prime and sub-contractors.
- c. Maintain applicable safety reference material on the job site.
- d. Attend the pre-construction conference, pre-work meetings including

preparatory inspection meeting, and periodic in-progress meetings.

- e. Implement and enforce accepted APPS and AHAs.
- f. Maintain a safety and health deficiency tracking system that monitors outstanding deficiencies until resolution. A list of unresolved safety and health deficiencies shall be posted on the safety bulletin board.
- g. Ensure sub-contractor compliance with safety and health requirements.

Failure to perform the above duties may result in dismissal of the SSHO, and/or a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

1.6.3 Meetings

1.6.3.1 Safety Coordination Meeting

- a. The Contractor will be informed, in writing, of the date of the safety coordination meeting. The purpose of the safety coordination meeting is for the Contractor and the Contracting Officer's representatives to become acquainted and explain the functions and operating procedures of their respective organizations and to reach mutual understanding relative to the administration of the overall project's Accident Prevention Plan (APP) before the initiation of work.
- b. Contractor representatives who have a responsibility or significant role in accident prevention on the project shall attend the safety coordination meeting. This includes the project superintendent, site safety and health officer, quality control supervisor, or any other assigned safety and health professionals who participated in the development of the APP (including the Activity Hazard Analyses (AHAs) and special plans, program and procedures associated with it).
- c. The Contractor shall discuss the details of the submitted APP to include incorporated plans, programs, procedures and a listing of anticipated AHAs that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the meeting and an agreement will be reached between the Contractor and the Contracting Officer's representative as to which phases will require an analysis. In addition, a schedule for the preparation, submittal, review, and acceptance of AHAs shall be established to preclude project delays.
- d. Deficiencies in the submitted APP will be brought to the attention of the Contractor at the safety coordination meeting, and the Contractor shall revise the plan to correct deficiencies and re-submit it for acceptance. Work shall not begin until there is an accepted APP.
- e. The functions of a safety coordination meeting may take place at the Post-Award Kickoff meeting for Design Build Contracts.

1.6.3.2 Weekly Safety Meetings

Conduct weekly safety meetings at the project site for all employees. The Contracting Officer will be informed of the meeting in advance and be allowed attendance. Minutes showing contract title, signatures of attendees and a list of topics discussed shall be attached to the Contractors' daily quality control report.

1.6.3.3 3-Phase Control Meetings

The appropriate AHA shall be reviewed and attendance documented by the Contractor at the preparatory, initial, and follow-up phases of quality control inspection. The analysis should be used during daily inspections to ensure the implementation and effectiveness of safety and health controls.

1.7 TRAINING

1.7.1 New Employee Indoctrination

New employees (prime and sub-contractor) will be informed of specific site hazards before they begin work. Documentation of this orientation shall be kept on file at the project site.

1.7.2 Periodic Training

Provide Safety and Health Training in accordance with USACE EM 385-1-1 and the accepted APP. Ensure all required training has been accomplished for all onsite employees.

1.7.3 Training on Activity Hazard Analysis (AHA)

Prior to beginning a new feature of work, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.8 ACCIDENT PREVENTION PLAN (APP)

The Contractor shall use a qualified person to prepare the written site-specific APP. Prepare the APP in accordance with the format and requirements of USACE EM 385-1-1 and as supplemented herein. Cover all paragraph and subparagraph elements in USACE EM 385-1-1, Appendix A, "Minimum Basic Outline for Preparation of Accident Prevention Plan". Where a paragraph or subparagraph element is not applicable to the work to be performed indicate "Not Applicable" next to the heading. Specific requirements for some of the APP elements are described below at paragraph EM 385-1-1 contents. The APP shall be job-specific and shall address any unusual in unique aspects of the project or activity for which it is written. The APP shall interface with the Contractor's overall safety and health program. The APP shall include an executed POD Form 248-R rev (1 Jun 98), Accident Prevention Program, Administrative Plan.

Any portions of the Contractor's overall safety and health program referenced in the APP shall be included in the applicable APP element and made site-specific. The Government considers the Prime Contractor to be the

"controlling authority" for all work site safety and health of the subcontractors. Contractors are responsible for informing their subcontractors of the safety provisions under the terms of the contract and the penalties for noncompliance, coordinating the work to prevent one craft from interfering with or creating hazardous working conditions for other crafts, and inspecting subcontractor operations to ensure that accident prevention responsibilities are being carried out. The APP shall be signed by the person and firm (senior person) preparing the APP, the Contractor, the on-site superintendent, the designated site safety and health officer and any designated CSP and/or CIH.

Submit the APP to the Contracting Officer 21 calendar days prior to the date of the safety coordination meeting for acceptance. Work cannot proceed without an accepted APP. The Contracting Officer reviews and comments on the Contractor's submitted APP and accepts it when it meets the requirements of the contract provisions.

Once accepted by the Contracting Officer, the APP and attachments will be enforced as part of the contract. Disregarding the provisions of this contract or the accepted APP will be cause for stopping of work, at the discretion of the Contracting Officer, until the matter has been rectified.

Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Contracting Officer, project superintendent, SSHO and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Contracting Officer, both verbally and in writing, for resolution as soon as possible. In the interim, all necessary action shall be taken by the Contractor to restore and maintain safe working conditions in order to safeguard onsite personnel, visitors, the public, and the environment.

Copies of the accepted plan will be maintained at the job site. The APP shall be continuously reviewed and amended, as necessary, throughout the life of the contract. Unusual or high-hazard activities not identified in the original APP shall be incorporated in the plan as they are discovered.

1.8.1 EM 385-1-1 Contents

In addition to the requirements outlined in Appendix A of USACE EM 385-1-1, the following is required:

- a. Names and qualifications (resumes including education, training, experience and certifications) of all site safety and health personnel designated to perform work on this project to include the designated site safety and health officer and other competent and qualified personnel to be used such as CSPs, CIHs, STSS, CHSTs. The duties of each position shall be specified.
- b. Qualifications of competent and of qualified persons. As a minimum, competent persons shall be designated and qualifications submitted for each of the following major areas: excavation; hazardous energy; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and

clothing to include selection, use and maintenance, crane operation; dining.

c. Health Hazard Control Program. The Contractor shall designate a competent and qualified person to establish and oversee a Health Hazard Control Program in accordance with USACE EM 385-1-1, Section 6. The program shall ensure that employees, on-site Government representatives, and others, are not adversely exposed to chemical, physical and biological agents and that necessary controls and protective actions are instituted to ensure health.

e. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of the capacity of the crane or hoist (or lifts over 50 percent of the capacity of a barge mounted mobile crane's hoists) at any radius of lift; lifts involving more than one crane or hoist; lifts of personnel; and lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks. The plan shall be submitted 15 calendar days prior to on-site work and include the requirements of USACE EM 385-1-1, paragraph 16.c.18. and the following:

(1) For lifts of personnel, the plan shall demonstrate compliance with the requirements of 29 CFR 1926.550(g).

(2) For barge mounted mobile cranes, barge stability calculations identifying barge list and trim based on anticipated loading; and load charts based on calculated list and trim. The amount of list and trim shall be within the crane manufacturer's requirements.

f. Alcohol and Drug Abuse Plan

(1) Describe plan for random checks and testing with pre-employment screening in accordance with the DFAR Clause subpart 252.223-7004, "Drug Free Work Force."

(2) Description of the on-site prevention program

g. Fall Protection and Prevention (FP&P) Plan. The plan shall be site specific and address all fall hazards in the work place and during different phases of construction. It shall address how to protect and prevent workers from falling to lower levels when they are exposed to fall hazards above 1.8 m (6 feet). A qualified person for fall protection shall prepare and sign the plan. The plan shall include fall protection and prevention systems, equipment and methods employed for every phase of work, responsibilities, assisted rescue, self-rescue and evacuation procedures, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised [every six months] for lengthy projects, reflecting any changes during the course of construction due to changes in personnel, equipment, systems or work habits. The accepted Fall Protection and Prevention Plan shall be kept and maintained at the job site for the duration of the project.

The Fall Protection and Prevention Plan shall be included in the Accident Prevention Plan (APP).

h. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, confined space entry, fall protection, crane operation, vehicle operator, forklift operators, personal protective equipment); list of requirements for periodic retraining/certification; outline requirements for supervisory and employee safety meetings.

1.8.2 Plan Acceptance

The Contractor shall not commence physical work at the site until the plan has been accepted by the Contracting officer, or his authorized representative. In developing and implementing its Accident Prevention Plan, the Contractor is also responsible for reviewing Section 1 of the most current edition of U.S. Army Corps of Engineers Safety and Health Requirement Manual EM 385-1-1.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

The Activity Hazard Analysis (AHA) format shall be prepared using POD Form 184-R, rev 16 Oct 98. Submit the AHA for review at least 15 calendar days prior to the start of each feature of work. Format subsequent AHA as amendments to the APP. An AHA will be developed by the Contractor for every operation involving a type of work presenting hazards not experienced in previous project operations or where a new work crew or subcontractor is to perform work. The analysis must identify and evaluate hazards and outline the proposed methods and techniques for the safe completion of each feature of work. At a minimum, define activity being performed, sequence of work, specific safety and health hazards anticipated, control measures (to include personal protective equipment) to eliminate or reduce each hazard to acceptable levels, equipment to be used, inspection requirements, training requirements for all involved, and the competent person in charge of that feature of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall protection methods used. For work with materials handling equipment, address safeguarding measures related to materials handling equipment. For work requiring excavations, include requirements for safeguarding excavations. An activity requiring an AHA shall not proceed until the AHA has been accepted by the Contracting Officer's representative and a meeting has been conducted by the Contractor to discuss its contents with everyone engaged in the activity, including on-site Government representatives. The Contractor shall document meeting attendance at the preparatory, initial, and follow-up phases of quality control inspection. The AHA shall be continuously reviewed and, when appropriate, modified to address changing site conditions or operations. The analysis should be used during daily inspections to ensure the implementation and effectiveness of the activity's safety and health controls.

The AHA list will be reviewed periodically (at least monthly) at the Contractor supervisory safety meeting and updated as necessary when procedures, scheduling, or hazards change.

Activity hazard analyses shall be updated as necessary to provide an effective response to changing work conditions and activities. The on-site

superintendent, site safety and health officer and competent persons used to develop the AHAs, including updates, shall sign and date the AHAs before they are implemented.

1.10 DISPLAY OF SAFETY INFORMATION

Within 1 calendar days after commencement of work, erect a safety bulletin board at the job site. The following information shall be displayed on the safety bulletin board in clear view of the on-site construction personnel, maintained current, and protected against the elements and unauthorized removal:

- a. Map denoting the route to the nearest emergency care facility.
- b. Emergency phone numbers.
- c. Copy of the most up-to-date APP.
- d. Current AHA(s).
- e. OSHA 300A Form.
- f. OSHA Safety and Health Protection-On-The-Job Poster.
- g. Confined space entry permit.
- h. Hot work permit.
- i. A sign indicating the number of hours worked since last lost workday accident.
- j. Safety and Health Warning Posters.

1.11 SITE SAFETY REFERENCE MATERIALS

Maintain safety-related references applicable to the project, including those listed in the article "References." Maintain applicable equipment manufacturer's manuals.

1.12 EMERGENCY MEDICAL TREATMENT

Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment.

1.13 REPORTS

1.13.1 Accident Reports

- a. All injuries, illness, and property damage, regardless of severity or magnitude are reportable. Reports shall be prepared on POD Form 265R and shall be submitted to the Contracting Officer no later than the end of the business day on which the incident occurred.
- b. For recordable injuries and illnesses, and property damage

accidents resulting in at least \$2,000 in damages, the Prime Contractor shall conduct an accident investigation to establish the root cause(s) of the accident, complete the USACE Accident Report Form 3394 and provide the report to the Contracting Officer within 5 calendar day(s) of the accident. The Contracting Officer will provide copies of any required or special forms.

1.13.2 Accident Notification

Notify the Contracting Officer as soon as practical, but not later than four hours, after any accident meeting the definition of Recordable Injuries or Illnesses or High Visibility Accidents, property damage equal to or greater than \$2,000. Information shall include contractor name; contract title; type of contract; name of activity, installation or location where accident occurred; date and time of accident; names of personnel injured; extent of property damage, if any; extent of injury, if known, and brief description of accident (to include type of construction equipment used, PPE used, etc.). Preserve the conditions and evidence on the accident site until the Government investigation team arrives on-site and Government investigation is conducted.

1.13.3 Monthly Exposure Reports

Monthly exposure reporting to the Contracting Officer is required to be attached to the monthly billing request. This report is a compilation of employee-hours worked each month for all site workers, both prime and subcontractor. The Contracting Officer will provide copies of any special forms.

1.13.4 Regulatory Citations and Violations

Contact the Contracting Officer immediately of any OSHA or other regulatory agency inspection or visit, and provide the Contracting Officer with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Contracting Officer.

1.13.5 Crane Reports

Submit crane inspection reports required in accordance with USACE EM 385-1-1, Appendix H and as specified herein with Daily Reports of Inspections.

1.14 HOT WORK

Prior to performing "Hot Work" (welding, cutting, etc.) or operating other flame-producing/spark producing devices, a written permit shall be requested from the Fire Division. CONTRACTORS ARE REQUIRED TO MEET ALL CRITERIA BEFORE A PERMIT IS ISSUED. The Contractor will provide at least two (2) twenty (20) pound 4A:20 BC rated extinguishers for normal "Hot Work". All extinguishers shall be current inspection tagged, approved safety pin and tamper resistant seal. It is also mandatory to have a designated FIRE WATCH for any "Hot Work" done at this activity. The Fire Watch shall be trained in accordance with NFPA 51B and remain on-site for a minimum of 30 minutes after completion of the task or as specified on the

hot work permit.

a. Oil painting materials (paint, brushes, empty paint cans, etc.), and all flammable liquids shall be removed from the facility at quitting time. All painting materials and flammable liquids shall be stored outside in a suitable metal locker or box and will require re-submittal with non-hazardous materials.

b. Accumulation of trays, paper, shavings, sawdust, boxes and other packing materials shall be removed from the facility at the close of each workday and such material disposed of in the proper containers located away from the facility.

c. The storage of combustible supplies shall be a safe distance from structures.

d. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.

e. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday. When possible, the main electric switch in the facility shall be deactivated.

f. When starting work in the facility, Contractors shall require their personnel to familiarize themselves with the location of the nearest fire alarm boxes and place in memory the emergency Fire Division phone number. ANY FIRE, NO MATTER HOW SMALL, SHALL BE REPORTED TO THE RESPONSIBLE FIRE DIVISION IMMEDIATELY.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, Federal and/or State OSHA regulations, and other related submittals and activity fire and safety regulations. The most stringent standard shall prevail.

3.1.1 Hazardous Material Use

Each hazardous material must receive approval prior to being brought onto the job site or prior to any other use in connection with this contract. Allow a minimum of 10 working days for processing of the request for use of a hazardous material. Any work or storage involving hazardous chemicals or materials must be done in a manner that will not expose Government or Contractor employees to any unsafe or unhealthful conditions. Adequate protective measures must be taken to prevent Government or Contractor employees from being exposed to any hazardous condition that could result from the work or storage. The Prime Contractor shall keep a complete inventory of hazardous materials brought onto the work-site. Approval by

the Contracting Officer of protective measures and storage area is required prior to the start of the work.

3.1.2 Hazardous Material Exclusions

Notwithstanding any other hazardous material used in this contract, radioactive materials or instruments capable of producing ionizing/non-ionizing radiation (with the exception of radioactive material and devices used in accordance with USACE EM 385-1-1 such as nuclear density meters for compaction testing and laboratory equipment with radioactive sources) as well as materials which contain asbestos, mercury or polychlorinated biphenyls, di-isocyanates, lead-based paint are prohibited. The Contracting Officer, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.

3.1.3 Unforeseen Hazardous Material

The design should have identified materials such as PCB, lead paint, and friable and non-friable asbestos. If material, not indicated, that may be hazardous to human health upon disturbance during construction operations is encountered, stop that portion of work and notify the Contracting Officer immediately. Within 14 calendar days the Government will determine if the material is hazardous. If material is not hazardous or poses no danger, the Government will direct the Contractor to proceed without change. If material is hazardous and handling of the material is necessary to accomplish the work, the Government will issue a modification pursuant to "FAR 52.243-4, Changes" and "FAR 52.236-2, Differing Site Conditions."

3.2 PRE-OUTAGE COORDINATION MEETING

Contractors are required to apply for utility outages at least 30 days in advance. As a minimum, the request should include the location of the outage, utilities being affected, duration of outage and any necessary sketches. Special requirements for electrical outage requests are contained elsewhere in this specification section. Once approved, and prior to beginning work on the utility system requiring shut down, the Contractor shall attend a pre-outage coordination meeting with the Contracting Officer to review the scope of work and the lock-out/tag-out procedures for worker protection. No work will be performed on energized electrical circuits unless proof is provided that no other means exist.

3.3 EQUIPMENT

3.3.1 Material Handling Equipment

- a. Material handling equipment such as forklifts shall not be modified with work platform attachments for supporting employees unless specifically delineated in the manufacturer's printed operating instructions.
- b. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.

c. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

3.3.2 Equipment and Mechanized Equipment

a. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.

b. Manufacture specifications or owner's manual for the equipment shall be on-site and reviewed for additional safety precautions or requirements that are sometimes not identified by OSHA or USACE EM 385-1-1. Such additional safety precautions or requirements shall be incorporated into the AHAs.

c. Equipment and mechanized equipment shall be inspected in accordance with manufacturer's recommendations for safe operation by a competent person prior to being placed into use.

d. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

3.4 EXCAVATIONS

The competent person for excavations performed as a result of contract work shall be on-site when excavation work is being performed, and shall inspect, and document the excavations daily prior to entry by workers. The competent person must evaluate all hazards, including atmospheric, that may be associated with the work, and shall have the resources necessary to correct hazards promptly. The competent person shall perform soil classification in accordance with 29 CFR 1926.

3.4.1 Utility Locations

Prior to digging, the appropriate digging permit must be obtained. All underground utilities in the work area must be positively identified by a private utility locating service in addition to any station locating service and coordinated with the station utility department. Any markings made during the utility investigation must be maintained throughout the contract.

3.4.2 Utility Location Verification

The Contractor must physically verify underground utility locations by hand digging using wood or fiberglass handled tools when any adjacent construction work is expected to come within three feet of the underground system. Digging within 0.061 m (2 feet) of a known utility must not be performed by means of mechanical equipment; hand digging shall be used. If construction is parallel to an existing utility the utility shall be exposed by hand digging every 30.5 m (100 feet) if parallel within 1.5 m (5 feet) of the excavation.

3.4.3 Utilities with Concrete Slabs

Utilities located within concrete slabs or pier decks, bridges, and the

like are extremely difficult to identify. The location must be coordinated with station utility departments in addition to a private locating service.

Outages on system utilities shall be used in circumstances where concrete chipping, saw cutting, or core drilling is required and utilities are unable to be completely identified.

3.4.4 Shoring Systems

Trench and shoring systems must be identified in the accepted safety plan and AHA. Manufacture tabulated data and specifications or registered engineer tabulated data for shoring or benching systems shall be readily available on-site for review. Job-made shoring or shielding shall have the registered professional engineer stamp, specifications, and tabulated data.

Extreme care must be used when excavating near direct burial electric underground cables.

3.4.5 Trenching Machinery

Trenching machines with digging chain drives shall be operated only when the spotters/laborers are in plain view of the operator. Operator and spotters/laborers shall be provided training on the hazards of the digging chain drives with emphasis on the distance that needs to be maintained when the digging chain is operating. Documentation of the training shall be kept on file at the project site.

3.5 ELECTRICAL

3.5.1 Conduct of Electrical Work

Underground electrical spaces must be certified safe for entry before entering to conduct work. Cables that will be cut must be positively identified and de-energized prior to performing each cut. Positive cable identification must be made prior to submitting any outage request for electrical systems. Arrangements are to be coordinated with the Contracting Officer and Station Utilities for identification. The Contracting Officer will not accept an outage request until the Contractor satisfactorily documents that the circuits have been clearly identified. Perform all high voltage cable cutting remotely using hydraulic cutting tool. When racking in or live switching of circuit breakers, no additional person other than the switch operator will be allowed in the space during the actual operation. Plan so that work near energized parts is minimized to the fullest extent possible. Use of electrical outages clear of any energized electrical sources is the preferred method. When working in energized substations, only qualified electrical workers shall be permitted to enter. When work requires Contractor to work near energized circuits as defined by the NFPA 70, high voltage personnel must use personal protective equipment that includes, as a minimum, electrical hard hat, safety shoes, insulating gloves with leather protective sleeves, fire retarding shirts, coveralls, face shields, and safety glasses. In addition, provide electrical arc flash protection for personnel as required. Insulating blankets, hearing protection, and switching suits may also be required, depending on the specific job and as delineated in the Contractor's AHA.

3.5.2 Portable Extension Cords

Portable extension cords shall be sized in accordance with manufacturer ratings for the tool to be powered and protected from damage. All damaged extension cords shall be immediately removed from service. Portable extension cords shall meet the requirements of NFPA 70.

3.6 CRYSTALLINE SILICA

Grinding, abrasive blasting, and foundry operations of construction materials containing crystalline silica, shall comply with OSHA regulations, such as 29 CFR 1910.94, and USACE EM 385-1-1, Appendix C. The Contractor shall develop and implement effective exposure control and elimination procedures to include dust control systems, engineering controls, and establishment of work area boundaries, as well as medical surveillance, training, air monitoring, and personal protective equipment.

3.7 HOUSEKEEPING

3.7.1 Clean-Up

All debris in work areas shall be cleaned up daily or more frequently if necessary. Construction debris may be temporarily located in an approved location, however garbage accumulation must be removed each day.

3.7.2 Falling Object Protection

All areas must be barricaded to safeguard employees. When working overhead, Barricade the area below to prevent entry by unauthorized employees. Construction warning tape and signs shall be posted so they are clearly visible from all possible access points. When employees are working overhead all tools and equipment shall be secured so that they will not fall. When using guardrail as falling object protection, all openings shall be small enough to prevent passage of potential falling objects.

-- End of Section --

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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01900

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PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section Table of Contents --

SECTION 01900

MISCELLANEOUS PROVISIONS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

DELETED

SD-02 Shop Drawings

As-Built Drawings

SD-06 Test Reports

Inspection of Existing Conditions

A written report with color photographs noting the condition of the existing facilities at the time of the inspection. One copy of the report including photographs shall be submitted to the Contracting Officer, prior to construction.

Dive Plan; G.

The Contractor shall submit a Dive Plan in accordance with the requirements of US Army Corps of Engineers Safety and Health Requirements Manual, EM 385-1-1, Section 30, Contract Diving Operations. The Dive Plan shall be submitted a minimum of fourteen (14) calendar days prior to the start of any diving work.

Dust Control; G

Method(s) of dust control.

Condition of Contractor's Operation or Storage Area

The Contractor shall submit to the Contracting Officer photographs and/or videos depicting the condition of the Contractor's Operation or Storage Area.

1.2 CONTRACTOR QUALITY CONTROL

To assure compliance with contract requirements, the Contractor shall establish and maintain quality control for materials and work covered by all sections of the TECHNICAL REQUIREMENTS in accordance with Section 01451 CONTRACTOR QUALITY CONTROL. Records shall be maintained for all operations including sampling and testing.

1.3 AS-BUILT DRAWINGS

As-built drawings shall be in accordance with Section 01780 CLOSEOUT SUBMITTALS.

1.4 DUST CONTROL

The amount of dust resulting from the Contractor's work shall be controlled to prevent the spread of dust to occupied portions of the construction site and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as flooding and pollution. Measures shall also be taken for dust control along haul routes and equipment parking areas.

1.5 PROTECTION

The Contractor shall take all necessary precautions to insure that no damages to private or public property will result from his operations. Any such damages shall be repaired or property replaced by the Contractor in accordance with the CONTRACT CLAUSES entitled "PERMITS AND RESPONSIBILITIES" and "PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS", without delay, and at no cost to the Government.

1.5.1 Warning Signs and Barricades

The Contractor shall be responsible for posting warning signs or erecting temporary barricades to provide for safe conduct of work and protection of property.

1.5.2 Protection of Grassed and Landscaped Areas

The Contractor's vehicles shall be restricted to paved roadways and driveways. Vehicles shall not be driven or parked on grassed and/or landscaped areas except when absolutely necessary for the performance of

the work and approved in advance by the Contracting Officer. Grassed or landscaped areas damaged by the Contractor shall be restored to their original condition without delay and at no cost to the Government.

1.5.3 Protection of Trees and Plants

Where necessary, tree branches and plants interfering with the work may be temporarily tied back by the Contractor to permit accomplishment of the work in a convenient manner, so long as they will not be permanently damaged thereby. If this is not feasible, they may be pruned, subject to written approval by the Contracting Officer.

1.5.4 Right of Entry

The Contractor shall protect all private property adjoining the project site. Right of Entry to use private property for the Contractor Work and Storage Area (see Drawings, sheet 1) as a result of this project has been negotiated by the Government and the State of Hawaii. This Right of Entry is attached to the end of this section. The Contractor shall agree to and abide by all restrictions contained in the Right of Entry. Construction costs associated with compliance to the Right of Entry by the State of Hawaii, the United States Army Corps of Engineers, or the Contract and any subcontractor shall be borne by the Contractor.

The Right of Entry is annotated as follows: Responsibilities of the Contracting Officer are designated as "CO", responsibilities of the construction contractor are designated as "CC" and joint responsibilities are designated as "CO/CC".

1.6 RESTORATION WORK

Existing conditions or areas damaged or disturbed by the Contractor's operations shall be restored to their original condition, or near original condition as possible, to the satisfaction of the Contracting Officer.

1.7 REMOVAL AND DISPOSAL

The Contractor shall salvage or recycle waste to the maximum extent practical as it relates to the capabilities of local industries. A record of the quantity of salvaged or recycled materials shall be maintained by the Contractor during the length of the project and submitted to the Contracting Officer at acceptance of the project. Quantities shall be recorded in the unit of measure of the industry. Reuse of materials on the site shall be considered a form of recycling. An example of such reuse would be the use of acceptable excavated materials as breakwater core material.

1.7.1 Rubbish and Debris

Rubbish and debris shall be removed from Government-controlled property daily unless otherwise directed, so as not to allow accumulation. Materials that cannot be removed daily shall be stored in areas designated by the Contracting Officer.

1.8 INTERFERENCE WITH GOVERNMENT OPERATIONS

The Contractor shall establish work procedures and methods to prevent interference with existing operations within or adjacent to the construction areas. Harbor operations shall take precedence over construction activities. The existing barge wharf shall be kept clear for cargo and fuel barge use, as well as possible other vessel calls, during the entire contract period. The Contractor may utilize the wharf to load/unload material and equipment, except for periods of scheduled barge service and other scheduled vessel calls. Procedures and methods shall also provide for safe conduct of work and protection of property which is to remain undisturbed.

1.8.1 Coordination

The Contractor shall coordinate all work with the Contracting Officer to minimize interruption and inconvenience to the harbor users or to the Government. Scheduling and programming of work will be established during the pre-construction conference. The Contractor shall coordinate wharf use with the State of Hawaii, Department of Transportation, Harbors Division.

1.8.2 Utilities and Facilities

All utilities and facilities within the area shall remain operable and shall not be affected by the Contractor's work, unless otherwise approved in writing in advance by the Contracting Officer.

1.9 CONTRACTOR'S OPERATIONS OR STORAGE AREA

An open operations or storage area will be made available as shown on the drawings, the exact location and boundaries of which will be determined by the Government. The Contractor shall construct a boundary fence to completely enclose the Work and Storage Area. The Contractor shall be responsible for the security necessary for protection of his equipment and materials, and shall maintain the area free of debris. No rusty or unsightly materials shall be used for providing the secure measure and such measure shall be erected in a workmanlike manner. Before any construction commences on establishing the operation/storage area, Contractor shall take photographs and/or videos of the site in order to establish the original conditions of the site. A duplicate set shall be made and submitted to the Government for its files. Upon completion and prior to the final acceptance of the contract work, the Contractor shall restore the area to its original condition.

1.10 GOVERNMENT PROJECT OFFICE

The Contractor shall provide, for use by Government supervisory and inspection personnel, a job-site office space with a floor area not less than 150 square feet. This office space may be within the Contractor's project office building if adjacent to the job site and if separated by a solid partition; otherwise a separate facility, adjacent to the job site, shall be provided with windows and screens, electricity, including a minimum of four (4) wall outlets and two (2) ceiling lights, a telephone, a desk with drawers, a layout table, two (2) chairs, a legal size five-drawer

locking file cabinet, and a fire extinguisher. Potable drinking water and temporary toilet facilities shall be made available to Government personnel, not necessarily within the project office, but in close proximity thereof. The cost of utilities including telephone, and operation and maintenance costs of the Government project office shall be borne by the Contractor. The Government will be responsible for its long-distance calls. Upon completion of the project, the project office and furnishings shall be removed and disposed of by the Contractor. In addition to the project office, the Contractor shall provide a secured, totally enclosed, and weather protected storage area. Minimum dimension of storage area shall be 100 square feet. Requirements for storage area shall also include a \$150,000.00 liability insurance policy to cover any loss to contents stored within the storage area.

1.11 GOVERNMENT TRANSPORTATION

1.11.1 Vehicle

Contractor shall furnish a 4-wheel drive vehicle to be used exclusively for Government personnel during entire contract performance period.

Maintenance of vehicle and fueling shall be the responsibility of the Contractor.

1.11.2 Boat

Contractor shall furnish a boat and qualified boat operator to be used exclusively for Government personnel a minimum of 12 hours per week for the entire contract performance period. Maintenance and fueling of boat shall be the responsibility of the Contractor.

1.12 GOVERNMENT DIVING SUPPORT

The Contractor shall provide support for Government construction inspection diving activities. Support shall include a dive platform adjacent to the area to be inspected and use of the Contractor's approved construction diving air compressor system.

1.13 INSPECTION

1.13.1 Preliminary Inspection of Existing Conditions

A minimum of fourteen (14) calendar days prior to actual construction, the Contractor shall arrange to have the Contractor's Quality Control representative meet with the authorized Contracting Officer's representative to inspect the existing facilities, and all other pertinent items within the construction area. The inspection shall be conducted to establish the existing conditions of the facilities, so that it may subsequently be determined whether any damages to the facilities are the result of the construction activity.

1.13.2 Final Inspection and Acceptance

The Contractor shall give the Contracting Officer, a minimum of fourteen (14) calendar days advance notice prior to final inspection for the project

works for acceptance by the Contracting Officer. All deficiencies found or final inspection shall be promptly and satisfactorily corrected by the Contractor upon notification by the Contracting Officer.

1.14 WORKING DIRECTIVES

1.14.1 Working Hours

All work shall be performed between the hours of 0700 to 1700 HST, Monday through Saturday. No work shall be accomplished on Sundays and all State of Hawaii and federal holidays without written permission from the Contracting Officer. Such written permission shall be available at the job site at all times during construction.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

-- End of Section --

RIGHT-OF-ENTRY FOR CONSTRUCTION

Kaumalapau Harbor Breakwater Repair
(Project or Activity)

See Exhibit "A" attached
(Tract Number or Other Property Identification)

Castle & Cooke, Inc. (Owner), title holder to, or authorized occupant of the land described above, in consideration of the benefits to be derived from the implementation of the Kaumalapau Harbor Breakwater Repair Project by the State of Hawaii (Sponsor) and the U.S. Army Corps of Engineers (USACE), hereby grants to the Sponsor and USACE, their employees, representatives, and assigns an irrevocable permit or right to enter upon the lands described above at any time within a thirty-six (36) month period from the date of this instrument in order to perform construction work of any nature, and to perform any other work necessary and incident to Project implementation, together with the right to trim, cut, fell, and remove therefrom trees, underbrush, obstructions, and any other vegetation, structures, or obstacles within the limits of the right-of-way, upon the following terms and conditions:

- CC 1. This permit includes the right of ingress and egress on other lands of the Owner not described above, provided that such ingress and egress is necessary and not otherwise conveniently available to the Government.
- CC 2. All tools, equipment, buildings, improvements, and other property taken upon or placed upon the land by the Sponsor shall remain the property of the Sponsor and may be removed by the Sponsor at any time within a reasonable period after the expiration of this permit or right-of-entry.
- CC 3. The Sponsor shall have the right to patrol and police the lands described above during the period of this permit or right-of-entry.
- CC 4. If any action of the Sponsor's and the USACE's employees, representatives, or assigns in the exercise of this right-of-entry results in damage to the real property, the Sponsor/USACE will, in its sole discretion, either repair such damage or make an appropriate settlement with the Owner. In no event shall such repair or settlement exceed the fair market value of the fee interest of the real property at the time immediately preceding such damage. The provisions of this clause are without prejudice to any rights the Owner may have to make a claim under applicable laws for any other damages than those provided herein.
5. The Owner shall not be responsible for damages to property or injuries to persons which may arise from, or be incident to, the use and occupation of the property or arising out of activities of the Sponsor or USACE, its officers, agents, employees, representatives or contractors; or for any contamination caused by the Sponsor or USACE; or for damages to the property or injuries to the person of the Owner's officers, agents, servants or employees, or others who may be on the property at their invitation or the invitation of any one of them, except for claims arising out of the negligence or willful misconduct of the Owner, its officers, agents, employees, or invitees.

Sponsor State of Hawaii shall be responsible, to the extent permitted by law, for damage or injury caused by Sponsor State of Hawaii's own officers and employees in the scope of their employment provided that Sponsor State of Hawaii's liability for such damage or injury has been determined by a court or agreed to by Sponsor State of Hawaii. Sponsor State of Hawaii shall pay for such damage provided that funds are appropriated and allotted for that purpose.

CO/CC

The USACE agrees and covenants that the United States will be responsible and the Owner will not be responsible or liable for damages to property or injuries to persons, including death, when such injuries or damages are caused by or result from the United States' exercise of the rights granted by this ROE, and additional injuries or damages are not caused or compounded by the negligence of the Owner (which are the responsibility of the Owner). Nothing in this ROE is deemed to waive the Owner's right to pursue any applicable administrative or statutory remedy, including but not limited to remedies available pursuant to the Federal Tort Claims Act, 28 U.S.C. 2671 et seq.

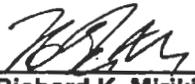
CC

6. If, during the construction activities authorized by this right-of-entry, the Sponsor, its employees, representatives, or assigns, discover a cultural or other property eligible for listing on the National Register of Historic Places, or a species listed as threatened or endangered under the federal Endangered Species Act, the Sponsor will immediately advise the Owner of the presence and nature of such discovery.

Executed this 21st day of May, 2004.

CASTLE & COOKE, INC.

By


Richard K. Mirikitani
Assistant Secretary

ARCH

MANU

Kalamenui

Gulch

Island of Lanai
Kaumalapau
Staging Area
"Exhibit A"

ROCKS

SHOAL

2-117A

3 Light

WT

Kaumalapau Harbor

WHARF

S COAST GUARD

RES

SHOAL

4.4

2 CAVES

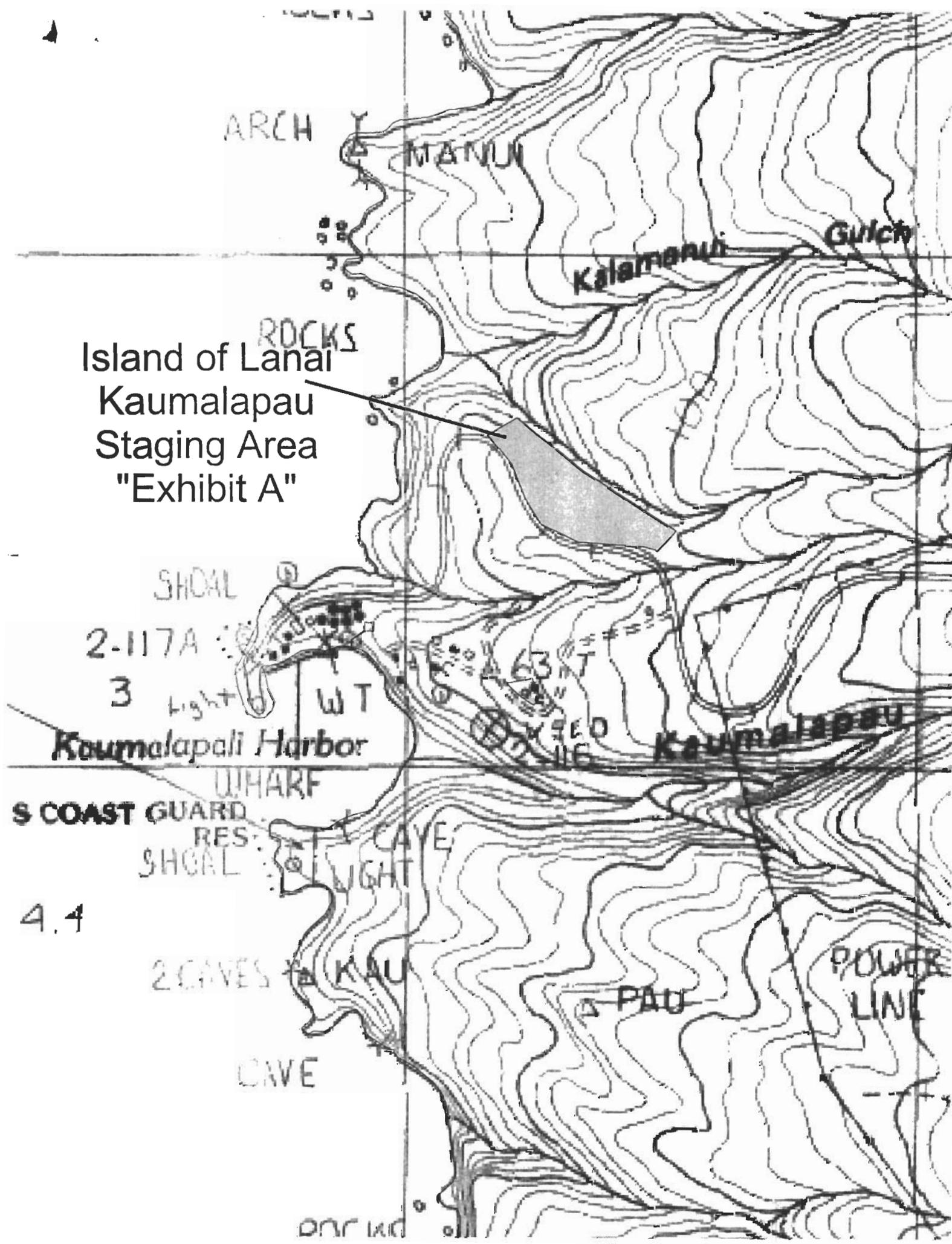
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SECTION 02215

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SECTION 02215

GEOTEXTILE FOR BEDDING LAYER

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 3786	(1987) Hydraulic Bursting Strength of Knitted Goods and Nonwoven Fabrics: Diaphragm Bursting
ASTM D 4354	(1999) Practice for Sampling of Geosynthetics for Testing
ASTM D 4439	(2002) Terminology for Geosynthetics
ASTM D 4491	(1989) Water Permeability of Geotextiles by Permittivity
ASTM D 4533	(1985, R1990) Trapezoid Tearing Strength of Geotextiles
ASTM D 4632	(1996) Test Method for Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	(1987) Determining Apparent Opening Size of a Geotextile
ASTM D 4833	(1988) Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products

1.2 GENERAL

The work provided for herein consists of furnishing all plant, labor, material, and equipment and performing all operations required for furnishing, hauling, and placing the geotextile, complete, as specified herein and shown on the contract drawings, and maintaining the geotextile until placement of the overlying material is completed and accepted.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When

used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Samples

Geotextile

If requested by the Contracting Officer, the Contractor shall provide to the Government geotextile samples for testing to determine compliance with any or all of the requirements in this specification. Sampling of geotextile shall be in accordance with ASTM D 4354. When samples are to be provided, they shall be submitted a minimum of 60 days prior to the beginning of installation of the same geotextile. All samples provided shall be from the same production lot as, and shall be the full manufactured width of will be supplied for the contract the geotextile by at least 10 feet long, except that samples for seam strength may be a full width samples folded over and the edges stitched for a length of at least 5 feet. Samples submitted for testing shall be identified by manufacturers lot designation.

SD-07 Certificates

Mill Certificate or Affidavit

The Contractor shall furnish the Contracting Officer, in duplicate, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the geotextile.

The mill certificate or affidavit shall attest that the geotextile meets the chemical physical and manufacturing requirements stated in this specification.

1.4 SHIPMENT AND STORAGE

During all periods of shipment and storage, the geotextile shall be protected from direct sunlight, ultra-violet rays, temperature greater than 140 degrees Fahrenheit, mud, dirt, dust and debris. To the extent possible, the fabric shall be maintained wrapped in a heavy duty protective covering.

PART 2 PRODUCTS

2.1 GEOTEXTILE FILTER FABRIC

2.1.1 Geotextile

The geotextile shall be a woven or non-woven pervious sheet of plastic yarn as defined by ASTM D 4439. The geotextile shall meet the physical requirements listed in Table No. 1 of the specifications. Fibers used in the manufacturer of geotextiles and the threads used in joining geotextiles, shall consist of long chain synthetic polymers, composed of at least 95% by weight polyolefins or polyesters. They shall be formed into a stable network such that the filament or yarns retain their dimensional

stability relative to each other, including selvages and shall contain stabilizers and inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and heat exposure. Woven slit film geotextiles (i.e., geotextiles made from yarns of a flat, tape-like character) will not be allowed. The edges of the geotextile shall be finished to prevent the outer fiber from pulling away from the geotextile.

2.1.2 Seams

The seams of the geotextile shall be sewn with thread of a material meeting the chemical requirements given above from geotextile yarn or shall be bonded by cementing or by heat. The sheets of geotextile shall be attached at the factory or another approved location, if necessary, to form sections not less than 36 feet wide. Seams shall be tested in accordance with method ASTM D 4632, using 1-inch square jaws and 12 inches per minute constant rate of traverse. The strengths shall be not less than 90 percent of the required tensile strength (Table 1) of the unaged geotextile in any principal direction.

TABLE NO. 1 - PHYSICAL REQUIREMENTS FOR
GEOTEXTILE FILTER FABRIC

<u>Physical Property</u>	<u>Test Procedure</u>	<u>Acceptable Values</u> ++	
		<u>Woven</u>	<u>Non-Woven</u>
Grab Tensile Strength (unaged geotextile)+	ASTM D 4632	315 pound minimum in any principal direction	205 pound minimum in any principal direction
Grab Elongation (unaged geotextile)+	ASTM D 4632	20 percent minimum in any principal direction	20 percent minimum in any principal direction
Puncture Strength (unaged geotextile)+	ASTM D 4833	115 pounds per square inch minimum	80 pounds per square inch minimum
Apparent Opening Size (AOS)	ASTM D 4751	No finer than the U.S. Standard Sieve No. 100 and no coarser than the U.S. Standard Sieve No. 50	No finer than the U.S. Standard Sieve No. 70 and no coarser than the U.S. Standard Sieve No. 30
Trapezoidal Tear Strength & Principal Direction	ASTM D 4533	115 lbs minimum in any principal direction	80 lbs minimum in any principal direction

TABLE NO. 1 - PHYSICAL REQUIREMENTS FOR
GEOTEXTILE FILTER FABRIC

Mullen Burst Strength	ASTM D 3786	510 lbs sq inch	255 lbs sq inch
Geotextile Permeability (kg)	ASTM D 4491	The permeability of the geotextile shall be greater than 0.10 cm per second	The permeability of the geotextile shall be greater than 0.10 cm per second
Sewn Seam Strength	ASTM D 4632	270 lbs minimum	185 lbs minimum

+ Unaged geotextile is defined as geotextile in the condition received from the manufacturer or distributor.

++ All numerical values represent minimum average roll values (i.e., any roll in a lot should meet or exceed the minimum in the table).

PART 3 EXECUTION

3.1 INSTALLATION OF THE GEOTEXTILE

The geotextile shall be placed in the manner and at the locations shown on the drawings. At the time of installation, the geotextile shall be rejected if it has defects, rips, holes, flaws, deterioration or damage incurred during manufacture, transportation or storage. The geotextile shall be placed with the long dimension parallel to the reference line and laid smooth and free of tension, stress, folds, wrinkles, or creases. The strips shall be placed to provide a minimum width of 36 inches of overlap for each joint. Temporary pinning or other anchoring methods (e.g. bedding stone weights) of the textile to help hold it in place until the overlying material is placed shall be allowed. The placement procedure requires that the length of the geotextile be 15 percent greater than the slope length. The Contractor shall adjust the actual length of the geotextile used based on initial installation experience. Any damage to the geotextile during its installation or during placement of overlying materials shall be replaced by the Contractor at no cost to the Government. The geotextile shall be protected from damage prior to and during the placement of overlying materials. This may be accomplished by limiting the height of drop to less than 1 foot, by placing a cushioning layer of sand or gravel on top of the geotextile before placing the material, or other methods deemed necessary. Before placement of overlying materials, the Contractor shall demonstrate that the placement technique will prevent damage to the geotextile.

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SECTION 02390

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SECTION 02390

PLACING CORE-LOC ARMOR UNITS

PART 1 GENERAL

1.1 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-04 Samples

Physical Model

At the same time as the submittal of the Work Plan for the Test Section, the Contractor shall submit a Physical Scaled Model of the completed breakwater. The model shall be constructed with substantial material. The Model shall have at least one layer of simulated underlayer stone. The Crest and toe details shall be modeled as shown on the Drawings. The plans for the Model shall be submitted to the Contracting Officer and CLS for approval prior to construction of the Model. The Contracting Officer will supply 800 scaled Core-Loc units for the Model. The units supplied will have C dimension of 2.125 inches and be formed from dense plastic.

The model shall be installed in the Contractors facilities on site, and be used in training and verification of Core-Loc placement. Upon completion of construction the physical model shall be delivered to the Contracting Officer and become the property of the Government.

SD-05 Design Data

Equipment, Method of Transportation and Placement - Execution Plan

The Contractor shall provide a detailed plan (Execution Proposal) describing the equipment and techniques he intends to use in shaping the breakwater and placing the Core-Loc units as shown on the drawings. This shall include methods and equipment intended to lift, set in place, and reposition the Core-Loc units.

If units are to be cast off site, equipment and methods intended for transporting Core-Loc units to the Kaumalapau Harbor staging area or project site shall also be submitted to the Contracting Officer. **The plan shall have been reviewed by the Core-Loc Specialist (CLS) in advance of the submittal, and the CLS comments shall accompany the submittal. Submittal shall include a review**

and approval certification statement from the CLS. If the Contractor elects to change the plan, a revised proposal, reviewed and approved by the CLS, shall be submitted to the Contracting Officer ten (10) days in advance of any such change.

Grid Diagram

The Contractor shall develop a Grid Diagram, based upon the Drawings, showing placement of each individual unit. The diagram shall be designed based on a Packing Density of 0.57, and conform to the recommendations of the CLS. The Grid Diagram will be adjusted as necessary, by the results of the required test section and or the results of excavation of the toe trench or other changes as authorized by the COR. The Contractor shall have computer, plotting and software capacity on site to adjust the Grid Diagram, if required, as well as update the placing diagram for the weekly report. The Contractor shall have email services and internet access at the site for exchanging data. The Grid Diagram shall be submitted to the Contracting Officer 30 days prior to placement of any units. Submittal shall include a review and approval certification statement from the CLS. **If modifications are required, the Contracting Officer shall have ten (10) days to review such submittals prior to any placement of Core-Loc.**

SD-06 Test Reports

Test Sections

The Contractor shall submit a work plan at least 14 days prior to the start of construction of the test sections with drawings showing the method of construction for the required Test Section. Submittal shall include a review and approval certification statement from the CLS.

SD-09 Manufacturer's Field Reports

Weekly Report

The Contractor shall submit, weekly, the list of Core-Loc units to be placed in the coming week with their fabrication dates. The report shall also contain the number of units placed to date compared to the theoretical number shown on the Grid Diagram for the same area, and a plan view and detailed digital listing of the X, Y positions of each Core-Loc placed to date. Each weekly report shall have a provision for comments by the CLS, and shall be reviewed by the CLS prior to submittal.

1.2 GENERAL DESCRIPTION OF WORK

The work consists of furnishing all plant, labor, equipment and material required for the placement of the Core-Loc units as shown on the plans.

PART 2 PRODUCTS

2.1 CORE-LOCS

Manufacturing of Core-Loc is specified under Section 03310 CONCRETE FOR CORE-LOC, Section 03110 FORMWORK FOR CONCRETE, CORE-LOC.

2.2 CORE-LOC SPECIALIST (CLS)

2.2.1 Scope

The Contractor shall retain a Core-Loc Specialist to advise on the preparation of the Execution plan, Test Section, Physical Model, Equipment, Grind Diagram revisions that may become necessary to the Grid Diagram, Quality Control and training of personnel. The CLS shall undertake a scope of work to assist the Contractor in meeting the requirements of this section. The CLS shall be on-site at a minimum as follows:

- a. During the initial casting trials
- b. During the test section
- c. During placement of the first 50 units on the main trunk of the structure
- d. During the rock toe trench development and tremie operation
- e. During placement of the first 100 units on the head
- f. During placement of the first crest units
- g. At a minimum of four (4) additional times as deemed necessary by the COR to meet the requirements of this section

2.2.2 Qualifications

The CLS shall be a Registered Professional Engineer in the United States or equivalent with design and construction experience on a minimum of two (2) successfully completed Core-Loc projects totaling not less than 5,000 cubic meters of concrete constructed as Core-Loc.

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2.2.3 Reporting

The CLS shall prepare written reports of all observations and recommendations to the Contractor with respect the the requirements of this section and general practice using Core-Loc units. The COR shall be informed of each site visit performed by the CLS.

PART 3 EXECUTION

3.1 HANDLING AND TRANSPORTING CORE-LOC UNITS

The Contractor shall exercise extreme caution in the loading, transportation, and unloading of new Core-Loc units, whether in the designated work area or in transportation of the Core-Loc units from the casting/storage location to the designated placement area. Core-Loc units shall not be handled until the concrete has reached a compressive strength of 4,000 psi as determined by concrete test cylinder breaks. **New Core-Loc units shall not be transported for placement until the concrete reaches the specified 28-day flexural strength indicated in Section 03310 CONCRETE FOR CORE-LOC.** A suitable cradle shall be used in transportation to avoid movement of the Core-Loc units in transit. Equipment and methods used for handling and transporting of Core-Loc shall be designed to avoid damage to the units. Use of lifting eyes or any other insertions cast in the new Core-Loc units will not be permitted. New Core-Loc units that have any fractures at any time during casting, curing, handling, transporting, or placement, prior to final acceptance in place will be considered defective and will be removed and replaced at no cost to the government. Disposal of defective Core-Loc units is the responsibility of the Contractor.

3.1.1 Delivery

Deliver Core-Loc units to the project site in a manner to preclude damage to the concrete units. During transport to the site, units shall be secured to avoid rocking and unit to unit contact.

3.1.2 Storage

Store Core-Loc units at the plant or on the project site to avoid cracking, distortion, staining or other physical damage.

3.2 PLACEMENT OF CORE-LOC

3.2.1 General

The Contractor shall be responsible for the control of his operations in accordance with Section 01451 CONTRACTOR QUALITY CONTROL to assure that Core-Loc units are placed in accordance with the contract requirements. **No Core-Loc unit shall be placed on the structure until the method of placement has been approved by the CLS.** Improperly placed Core-Loc units shall be relocated, as required and at the direction of the Contracting Officer, at no additional cost to the Government. Replacement of the damaged Core-Loc shall be the responsibility of the Contractor. Any given section of Core-Loc repair shall be built from the toe up to the crest. Core-Loc elements shall not be placed on the structure until the Underlayer Stone foundation has been properly installed, and accepted.

3.2.2 Test Section Placement

The Contractor shall build a test section of the Core-Loc placement on land. The section shall include the Toe Trench and Toe Buttress. The

Contractor shall carry out a full handling test to ensure the placing crew has fully understood the principle of unit attitude variation. This test will help to determine appropriate lengths of sling sets to be used. The CLS must be present on site for these tests. The section shall be graded on a 1.5 to 1 slope and constructed in the method depicted on the drawings. It is anticipated the Test Section will involve the placement and replacement of approximately 20 to 25 Core-Loc units and be approximately 75 feet long.

The test section is intended to establish an in-the-field standard built to the Grid Diagram. The test section will demonstrate the Contractor's ability to place the Core-Loc units in the Grid Pattern to achieve the appropriate interlocking and packing density. Based on the test section, the Contractor shall make whatever modifications are necessary to the placement procedure, equipment, or techniques to reach the placement requirements.

The Contractor will construct the test section to represent the neat lines and grades shown on the drawings using stone and Core-Loc units from the stockpiles that will ultimately be used for construction. The Contractor shall notify the COR at least one week before the start of construction. The Contractor shall create test section drawings depicting the test, layout the work, provide survey control, construction surveys, and verification surveys in accordance with the Specifications and to the dimensions shown on the Drawings. The Test Section Core-Loc grid pattern shall be predetermined with the assistance of the CLS, and the units placed using the GPS positioning methodology as outlined in paragraph Position Control and Data Collection. The Contractor shall make every effort to place the core, underlayer, and toe buttress and toe backfill to the lines, grades and thicknesses shown on the Drawings. The Contractor shall account for the approximate stone tonnage placed in the test section. **The Contractor shall make every effort to place the Core-Loc units in the test section in the Grid Pattern approved by CLS. If the units have not been placed according to the specified Packing Density, or sufficient interlocking is not achieved, the Contracting Officer will reject the test section and the test section shall be re-built at no additional cost to the Government.**

The Contracting Officer's approval of the Contractor's test section shall not relieve the Contractor of the responsibility for proper execution of the works, including but not limited, to placing of the Core-Loc units. The Test Section shall remain in place until 50% of the Core-Loc units have been placed on the breakwater.

3.2.3 Placement of Core-Loc Toe Units

Core-Loc Toe units may be placed in a random attitude in the locations shown on the Grid Diagram. This pattern shall be verified in the test section. The maximum distance between adjacent units shall be as shown on the Grid Pattern. Toe Core-Loc Units shall be placed in a single layer and lowered to rest before being released. **Toe Core-Loc Units shall rest firmly on the prepared Underlayer Stone grade or unless otherwise indicated on drawings.** Divers shall check the final placement of all units for correctness and unit keying. The second row of Core-Loc units shall also

be placed with the toe units, forming a two row toe in advance of the placement of units on the remainder of the slope. Special placement shall be made along the toe in the excavated rock trench. The trench shall be excavated into competent rock as shown on the drawings. The trench shall be backfilled with Tremie concrete meeting the requirements of Section 03300 CAST-IN-PLACE STRUCTURAL CONCRETE. **The Contractor shall provide a detailed placing plan for this area, approved by the CLS.** The Contractor may build a temporary breakwater to enable toe construction.

3.2.4 Placement of Core-Loc Slope and Crest Units

Core-Loc slope and crest units shall be placed in a single Random Packed layer. Every slope and crest Core-Loc unit shall be resting on the prepared Underlayer Stone surface. **The Contractor shall insure that the specified Packing Density of 9.26 Core-Loc units per 1000 square feet of slope surface area is strictly maintained during construction to assure proper interlocking.** The Packing Density shall be verified for all Grid Diagrams by the CLS, and the calculations submitted to the Contracting Officer. The Core-Loc units shall be placed at the locations shown on the approved Grid Diagram. The actual location of the centroid of each unit shall be within 15 inches of the theoretical location shown on the Grid Diagram. Units shall be placed randomly, with adjacent units having different attitudes. No two units in the same horizontal row should be in contact. Each unit must be keyed into two units on the row below. Less than one-third of the units shall have an H-member parallel to the slope. Units with this attitude must be distributed throughout the slope and shall not be found in groups. Divers shall check the final placement of all units for correctness and unit keying. No unit shall be released into position until the optimum position is verified by the diver. (Note - All diving shall be done in accordance with the requirements of EM 385-1-1, U.S. Army Corps of Engineers, Safety and Health Requirements Manual.)

3.2.5 Position Control and Data Collection

The Core-Loc placing crane shall be equipped with a real time differential GPS equipment to determine and confirm the placement of the individual units. The system shall be equipped such that each days planned work can be entered into the data collector, and a targeting system used to guide the crane boom to the theoretical position for for each unit placed. Planning for each day shall consider satellite availability and operational windows necessary to achieve real time accuracy of better than +/-0.5 feet at a one second refresh rate and a stationary accuracy of better than +/- 0.05 feet. As a unit is lifted to be placed into the work, the unique number of the Core-Loc assigned at casting shall be associated with the unique placement position. Once the unit is lowered into its final position, but prior to release of the lifting cable, the actual coordinates shall be recorded into the data collection system. At the end of each work day, that day's placing information shall be electronically recorded, and printed in hard copy as a backup. For each weekly report, the data shall be merged into an Excel spreadsheet that shows the grid location number, the theoretical coordinates, the actual coordinates, the deviation, the unique Core-Loc number placed in that position, the date of the Core-Loc casting, the date of placement, and the age at placement. The reporting requirements shall be developed by the CLS for the Contractor. The

positioning and data recording system shall be approved by the Contracting Officer.

3.3 INSPECTION

The COR will check the Contractor's daily record of work. However, the presence of the COR shall not relieve the Contractor of the responsibility for the proper execution of the work. The Contractor will be required, without additional compensation, to furnish the COR with all necessary labor and equipment, including boats and diving equipment that may be necessary for inspecting the work.

As soon as practical after the completion of the Core-Loc unit placement, the work will be examined by the COR and the Contractor. During these examinations, the Contractor shall perform an alignment survey to be used to prepare a final drawing showing all dimensions, elevations, and cross sections of the "as-built" conditions of the breakwater. The Contractor will be required to remove excess materials or place additional materials, as directed by the COR, in order to comply with the Contract Documents. Sections will be examined thoroughly by soundings and topographical surveys as specified in Section 02486 STONE PLACEMENT AND CONSTRUCTION.

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SECTION 02485

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PART 2 PRODUCTS

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PART 3 EXECUTION (Not Applicable)

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SECTION 02485

STONE MATERIALS

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 127 (1988; R 1993) Specific Gravity and Absorption of Coarse Aggregate

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Selection of borrow sources and detailed plans for quarry operations.

SD-04 Samples

Samples of stone.

1.3 STONE MATERIALS

1.3.1 Core Stone

Core stone is expected to be salvaged excess rubblemound stone from the existing rubblemound structure. Concrete chunks will also be acceptable for Core stone. Core stone may be new stone supplied from an approved source Core stone imported to the site for incorporation into the work shall be well graded and weigh between 500 pounds and 5000 pounds. New stone shall meet the quality requirements in PART 2 PRODUCTS.

1.3.2 Underlayer, Toe Buttress and Bidding Stone

All underlayer, toe buttress and bedding stone shall be new stone conforming to the quality requirements in PART 2 PRODUCTS.

1.3.3 Toe Trench Backfill

Toe trench backfill may be salvaged excess stone from the existing rubblemound meeting the gradation specified, or new stone from an approved source. New stone shall meet the quality requirements in PART 2 PRODUCTS.

1.4 SOURCES OF STONE

Stone may be quarried or obtained from other sources as approved. All stones shall meet the requirements specified herein. Development of stone source and improvements of any access to the site shall be at the Contractor's responsibility and expense. The sources from which the Contractor proposes to obtain the material shall be selected well in advance of the time when the stones will be needed in the work. Approval of a source or sources of stone shall not be construed as approval of all material from that source or sources. The right is reserved to reject materials produced from localized areas, zones, or strata when such materials are unsuitable as determined by the Contracting Officer.

1.5 SAMPLING AND FIELD TESTING OF STONE

1.5.1 Sampling

Samples of stones from sources proposed by the Contractor shall be taken at locations designated by the Contracting Officer. The samples will be used as standards of the rock quality to be furnished by the Contractor. Duplicate sets of samples shall be taken, numbered, referenced and identified. One set shall remain at the Contractor's quarry (source) for later comparison with actual pieces of rock to be furnished for the project. The second set of samples shall be delivered, at the Contractor's expense, to an independent testing laboratory on Oahu to be designated by the Contracting Officer, no later than 30 days in advance of the time when placing of stone is expected to begin. Sampling, identification, preparation and transportation of samples shall be in accordance with ASTM D 75.

1.4.2 Field Testing of Stones

Prior to removal from the source, the Contractor shall field test representative rock pieces selected by the Contracting Officer by dropping from a vertical height of 10 feet on a solid rock surface or on a bed of comparable size rock proposed for the project. Broken, cracked, or otherwise damaged stone found by dropping will not be acceptable and shall be disposed of by the Contractor at his expense.

1.6 QUARRY AND BORROW OPERATIONS

1.6.1 Quarry and Borrow Areas

The Contractor shall be responsible for obtaining all rights-of-way required in connection with his borrowing and quarrying operations. The Contractor shall obtain from the owners the right to procure materials, pay all charges involved, and bear all expenses of developing the sources,

including rights-of-way for hauling. Necessary plant, labor, and materials for clearing, scraping, disposal, loading, hauling, and all other operations required to obtain the stones and borrow materials shall be provided by the Contractor at no additional cost to the Government. The Contractor shall, at his own expense, maintain all haul roads required for access from the quarry areas to the site of work and provide additional haul roads as required. The Contractor shall maintain necessary warning signs, and place warning lights between sundown and sunup along roads subject to public traffic. The Contractor shall be responsible for trespassing upon or injury to private lands adjacent to right-of-way resulting from his actions or those of his employees.

1.6.2 Operation Requirements

The Contractor shall submit to the Contracting Officer, within 15 days after receipt of notice to proceed and 30 days before any work in the borrow and quarry areas, plan for the Contractor's borrow and quarry operations. Plans of operation shall include the following:

- a. Selection of quarry-borrow sources.
- b. Detailed plans for quarry operation including:
 - (1) Maps, descriptions, and plans of proposed road to quarry and borrow sources.
 - (2) Method(s) of excavation.
 - (3) Plans for drainage and restoration after completion of work.All operations shall be subject to the approval of the Contracting Officer.

PART 2 PRODUCTS

2.1 STONE

2.1.1 General

All stones shall be dense, durable, and of a suitable quality to ensure permanence in the structure and in the climate in which it is to be used. Stones shall be free from cracks, seams, and other defects that would tend to increase unduly its deterioration from natural causes.

2.1.2 Physical Requirements

Physical properties of the stones shall conform to the following requirements when tested in accordance with the respective ASTM Standards. Acceptance tests shall be performed on individual stone piece 10 to 30 pounds in weight in lieu of the sizes specified in ASTM C 127. Test apparatus shall be improvised to accommodate the above stone sizes. All acceptance tests shall be made by and at the expense of the Contractor. Samples of stone shall be furnished as specified in paragraph SAMPLING AND FIELD TESTING OF STONE.

ASTM C 127 Bulk Specific Gravity (Saturated
 Surface Dry) Not Less than 2.5.

ASTM C 127 Absorption - Not More than 4 percent.

PART 3 EXECUTION (Not Applicable)

See Section 02486 STONE PLACEMENT AND CONSTRUCTION.

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SECTION 02486

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SECTION 02486

STONE PLACEMENT AND CONSTRUCTION

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ENGINEER MANUAL (EM)

EM 1110-2-1003 (1994) Hydrographic Surveying

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Equipment Data and Execution Plan

Prior to starting work, a list of all equipment, tools, machines, including their sizes, capacities and operating speeds, to be used in the performance of the work shall be submitted. All the plant shall be maintained in satisfactory working condition at all times. The Contractor shall provide a detailed proposal describing the equipment and techniques he intends to use in placing the stone as shown on the drawings. This shall include methods and equipment intended to transport, excavate, lift, set in place, and reposition stone as required. **This proposal shall be submitted to the Contracting Officer in conjunction with the Execution Plan specified in Section 02390 PLACING OF CORE-LOC ARMOR UNITS.**

Check Survey Data

A copy of the record of each check survey shall be submitted within one (1) workday after the survey.

Work Plan

The Contractor shall provide a Work Plan detailing the

procedures proposed for the accomplishment of the work. The procedures shall provide for safe conduct of the work, use of proper equipment per type of material for excavation, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress, and disconnection of utilities. The Work Plan shall include the details of the intended stone placement approach and sequencing of the work. The construction sequence shall provide for protection of the harbor to at least the same level of protection existing at the harbor prior to commencement of construction. Excavation and shaping of the existing rubblemound shall be done in such a manner that wave protection afforded by the existing structure is maintained.

DELETED

1.3 MATERIALS

The work covered by this section consists of furnishing all plant, labor, and equipment for performing all operations in connection with the placement of underlayer stone, toe bedding stone, buttress toe stone, core stone and toe trench backfill for the breakwater reconstruction as shown on the drawings and in accordance with these specifications and conditions of the contract. Also, included is all excavation and grading necessary to meet the lines and grades shown on the drawings.

1.3.1 Core Stone

The Core Stone shall be excavated and graded or placed to the lines and grades shown on the drawings.

1.3.2 Toe Bedding

The toe bedding stone, placed over geotextile filter fabric, shall be used when the new breakwater toe is constructed on sand and sediment native bottom material.

1.3.3 Underlayer and Toe Buttress Stone

Underlayer and Toe Buttress Stone shall be furnished and placed on the prepared core stone and as toe buttress stone in the locations shown on the drawings.

1.3.4 Toe Trench Backfill

The Toe Trench Backfill shall be placed in the toe trench to the lines and grades shown on the drawings.

PART 2 PRODUCTS

2.1 STONE MATERIALS

All new stone necessary to complete the project shall be provided by the Contractor as specified in Section 02485 STONE MATERIALS.

PART 3 EXECUTION

3.1 GENERAL

The Contractor shall place stone materials for the structure as shown on the drawings. All materials shall be placed uniformly within the slope lines and grades indicated on the drawings or as directed by the Contracting Officer's Representative. Material shall be placed by equipment capable of handling materials of the size specified.

3.2 DEBRIS

Any timbers, unsatisfactory material and debris within the area of construction shall be removed except as otherwise directed by the Contracting Officer's Representative, and upon removal shall become the property of the Contractor. All materials shall be properly disposed of in conformance with the requirements of the Section 01430 ENVIRONMENTAL PROTECTION, including any applicable local requirements. There will be no additional payments for materials to be disposed.

3.3 TURBIDITY CONTROLS

The Contractor shall control the placement of stone materials in a manner that minimizes the turbidity of ocean waters. The Contractors' operations shall comply with Section 01430 ENVIRONMENTAL PROTECTION.

3.4 EXCAVATION

3.4.1 General

General excavation shall consist of removal of materials encountered in preparing the foundations to the lines, grades, and elevations indicated on the drawings as specified herein, or as directed by the Contracting Officer. Care shall be exercised by the Contractor not to excavate below the grades shown on the drawings or as directed by the Contracting Officer.

Grading shall be in conformity with the typical sections shown on the drawings and the tolerances specified in Paragraph GRADE TOLERANCES. Any excessive excavation, as determined by the Contracting Officer, due to the fault or negligence of the Contractor, shall be backfilled with specified material to grades shown on the drawings. Corrective measures shall be done by and at the expense of the Contractor. No separate measurements or payment shall be made for excavation.

3.4.2 General Excavation

Excavation shall consist of removal of existing rubblemound material as indicated on the drawings or as directed by the Contracting Officer, except hard solid rock.

3.4.3 Hard Rock Excavation

The hard rock in the toe trench shall be excavated as shown on the drawings. Blasting shall not be allowed. The toe trench shall be backfilled to the limits shown on the drawings after placement of the Core-Loc units with tremie concrete.

3.4.4 Disposition of Satisfactory Materials

Excavated materials which are suitable and approved by the Contracting Officer for incorporation into the finished work shall be placed directly therein or stockpiled for future use within the limits of the work, as directed by the Contracting Officer. **Excess stone material shall be disposed/stockpiled as shown on the drawings.**

3.5 STONE PLACEMENT

3.5.1 Underlayer, Toe Buttress, Toe Bedding, Core and Toe Trench Backfill Placement

The existing rubblemound breakwater shall be excavated to the lines and grades shown on the drawings to permit placement of the Underlayer and Toe Buttress Stone to the thicknesses and lines and grades shown on the drawings. The thicknesses of the underlayer and toe buttress stone shall not deviate from the contract drawings.

Excavation or reworking of material for placement of underlayer, toe buttress stone and core-loc blocks shall be considered incidental to stone and core-loc placement.

3.5.1.1 Underlayer and Toe Buttress Stone

Underlayer and buttress stone shall be placed to the lines and grades shown on the drawings. The stone shall be placed to a full zone thickness in one operation in a manner to avoid displacing the underlying or bedding material or placing undue impact force on underlying materials and supporting subsoils. Underlayer and Toe Buttress Stone shall be placed in a manner to produce a resultant graded mass of stone with minimum voids. Rearranging of individual stones may be required to achieve this result. Placement by any method which is likely to cause segregation will not be permitted. Placement shall begin at the bottom of the slope and proceed upward. Casting or dropping of stone over two (2) feet or moving by drifting and manipulating down the slope shall not be permitted. final finished slope shall be achieved as the material is placed.

3.5.1.2 Toe Bedding Stone

Toe bedding stone shall be placed to the lines and grades shown on the drawings. The toe bedding stone shall be placed in a manner to produce a resultant graded mass of stone with a minimum of voids. The stone shall be lowered by bucket to within 2 feet of the bottom before it is released.

3.5.1.3 Core Stone

Core stone may be supplied from an approved quarry or salvaged excess rubblemound stone from the breakwater. The core stone slope shall be excavated to the lines and grades shown on the drawings. The excavated stone or quarried rock shall be placed in the breakwater to the lines and grades shown on the drawings.

3.5.1.4 Toe Trench Backfill

Toe trench backfill shall be supplied from an approved quarry or salvaged excess rubblemound stone and meet the gradation specified. The backfill shall be lowered in a bucket to the toe buttress berm and moved into position over the toe trench prior to release. Casting or dropping of stone over two (2) feet shall not be permitted. Proper placement of the toe trench backfill shall be confirmed by diver inspection. Damage to a core-loc unit will require replacement of the core-loc unit at the Contractor's expense.

3.6 GRADE TOLERANCES

The finished surface and stone layer thickness shall not deviate from the lines and grades shown on the contract drawings by more than the tolerances listed below. Tolerances are measured perpendicular to the indicated neat lines. The average of the deviations ascertained for three (3) consecutive profiles separated by 25 feet shall be less than 1.3 feet. Averages for underlayer on the slope and toe buttress stone shall be calculated separately. Extreme limits of the tolerances given shall not be continuous in any direction for more than five (5) times the nominal stone dimension nor for an area greater than 100 square feet of the structure surface.

NEATLINE TOLERANCES

Stone	Above Neatline (Inches)	Below Neatline (Inches)
Underlayer on Slope	12	12
Toe Buttress Stone	12	6
Underlayer on Crest	9	6
Toe Bedding Stone	12	6
Core	12	12

In addition to the vertical tolerances above, the horizontal alignment for the finished stone courses shall be +/-2 feet from that shown on the drawings provided the lines, arcs, and curves are smooth and continuous without visible bends, deflections and kinks.

The intention is that the work will be built generally to the required elevations, slope and grade and that the outer surfaces shall be even and present a neat appearance. Placed material not meeting these limits shall be removed or reworked as directed by the Contracting Officer's Representative. Excess material permitted to remain in place by the Contracting Officer's Representative will not be paid for.

3.7 QUALITY CONTROL

3.7.1 General

The Contractor shall establish and maintain quality control for all work performed at the quarry or quarries and the job site under this section to assure compliance with contract requirements. It shall maintain records of its quality control tests, inspections and corrective actions. Quality control measures shall cover all materials, equipment, tests and construction operations including but not limited to the following:

- a. Placement of all materials to the slope and grade lines shown on the contract drawings and in accordance with this Section of the specifications.
- b. Conducting all operations in compliance with the requirements of Section 01430 ENVIRONMENTAL PROTECTION.
- c. Observance of safety regulations.

3.7.2 Records

A copy of the waste manifests, receipts, records of inspections and tests, as well as records of any corrective action taken, shall be furnished to the Contracting Officer's Representative in accordance with Section 01451 CONTRACTOR QUALITY CONTROL.

3.7.3 Check Surveys

Surveys made by the Contractor will be required on each material placed for determining that the materials are acceptably placed in the work. The Contractor shall perform verification surveys as the work progresses to verify that lines, grades, and thicknesses for the completed work are within the specified tolerances. Verification surveys shall be performed with a total station survey instrument and range pole-mounted prism; surveyor's level, range pole and surveyor's tape; tag line and sounding basket; or other methods that are consistent with the requirements of this section, in accordance with EM 1110-2-1003, subject to the approval of the COR. Range poles, if used, shall be fitted with a flat, durable, 12 inch diameter base. Electronic depth recorder will not be allowed for checking stone courses after stone placement or excavation to grade of existing rubblemound. The Contractor shall provide all boats, personnel and other equipment necessary to adequately and safely perform verification surveys.

3.7.3.1 Scope

The Contractor shall survey the harbor bottom and existing rubblemound

breakwater prior to placement of stone materials and excavation of the existing rubblemound material. Bottom survey and existing rubblemound profiles shall be performed at 25 foot stations along the Survey Control Line (SCL). The SCL shall be established parallel to the long axis of the structure. Profiles shall run perpendicular to the SCL and structure alignments, and shall extend at least 25 feet beyond the structure limits. **Profile surveys shall be performed at 15 degree radial intervals around the breakwater head at STA 2+20.**

Verification surveys for each stone course shall consist of cross sections of the structures performed by the Contractor at intervals of 25 feet along the SCL. **Verification surveys of the stone courses shall be performed at the same stations along the SCL as the bottom surveys including radial intervals along the head section.** Take elevation readings (soundings) every 5 feet, and at every break in grade, to a distance not less than 25 feet beyond the limits of the stone course being surveyed. Take additional elevation readings as directed by the COR. Verification surveys shall also be taken of the core stone layer prior to placement of succeeding layers.

3.7.3.2 Execution

Above water surveys shall be accomplished using conventional land surveying methods. For surveys below water, the Contractor shall move into position for each reading using a boat or platform, as required, to provide complete coverage of the section from the water line to the harbor bottom. All verification surveys shall be referenced to the SCL and Mean Lower Low Water Datum. Verification surveys shall be conducted in the presence of the COR unless waived by the COR. For each verification survey performed, the Contractor shall transmit a verification survey record containing the following information to the COR:

- a. Structure and stone type surveyed.
- b. Verification survey location (station along the SCL).
- c. Date and time of survey.
- d. Weather conditions.
- e. Staff gauge reading at time of survey.
- f. Name of participants.
- g. Field notes.
- h. A plot on cross section paper showing the SCL, neat lines, and individual elevation readings.

The exact format of the verification survey record will be agreed upon by the COR and the Contractor.

DELETED

3.8 LIMITATIONS OF PLACEMENT PROCEDURES

The Contractor is responsible for the structures until completed and accepted by the Contracting Officer.

-- End of Section --

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SECTION 03110

FORMWORK FOR CONCRETE CORE-LOC

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 347R (1994) Guide for Formwork for Concrete

DEPARTMENT OF COMMERCE (DOC)

DOC PS 1 (1983) Construction and Industrial Plywood

1.2 DESIGN REQUIREMENTS

The design, engineering, and construction of the formwork shall be the responsibility of the Contractor. The formwork shall be designed for anticipated live and dead loads and shall comply with the tolerances specified in Section 03310 CONCRETE FOR CORE-LOC, Paragraph Construction Tolerances. The formwork shall be designed as a complete system with consideration given to the effects of cementitious materials and mixture additives such as fly ash, cement type, plasticizers, accelerators, retarders, air entrainment, and others. The adequacy of formwork design and construction shall be monitored prior to and during concrete placement as part of the Contractor's approved quality control plan.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Formwork

Drawings and design computations for all formwork required shall be submitted at least 14 days either before fabrication on site or before delivery of prefabricated forms. All submittals shall be

approved by the CLS prior to submission to the Government (refer to Section 02390 PLACING CORE-LOC ARMOR UNITS for definition of CLS). The CLS review comments shall be included with the drawings.

If restoring is permitted, the method, including location, order, and time of erection and removal shall also be submitted for review.

SD-03 Product Data

Materials

Manufacturer's literature shall be submitted for all form materials, plywood, concrete form hard board, form accessories, prefabricated forms, form coating.

SD-09 Manufacturer's Field Reports

Inspection

The Contractor shall submit field inspection reports for concrete forms.

1.4 FORM DESIGN

The forms shall be designed by a person regularly engaged in the design and manufacture of concrete forms. The shape of the Core-Loc structural elements is a patented shape. That patent is held by the U.S. Army Corps of Engineers and no patent royalties will be required for execution of this project.

1.5 SHOP DRAWINGS

The shop drawings and data submitted shall include the type, size, quantity, and strength of all materials of which the forms are made, the plan for jointing of facing panels, details affecting the appearance, and the assumed design values and loading conditions.

PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Forms and Form Liners

Forms and form liners shall be fabricated with facing materials that will produce a finish meeting the specified construction tolerance requirements and the following surface classifications as defined in ACI 347R for a Class "B" Finish. This class of finish shall apply to all surfaces. The form facing material shall be composed of tongue-and-groove or shiplap lumber, plywood conforming to DOC PS 1, Grade B-B concrete form, tempered concrete form hardboard or steel. Steel lining on wood sheathing will not be permitted.

2.1.2 Form Coating

Form coating shall be commercial formulation that will not bond with, stain, cause deterioration, or any other damage to concrete surfaces. The coating shall not impair subsequent treatment of concrete surfaces depending upon bond or adhesion nor impede the wetting of surfaces to be cured with water or curing compounds. If special form liners are to be used, the Contractor shall follow the recommendation of the form coating manufacturer.

2.2 ACCESSORIES

No through ties or through fasteners of any type will be allowed. All control, fasteners, connectors, and form stabilizers will be external to the completed core-lot elements.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Form Construction

Forms shall be constructed true to the structural design and required alignment. The form surface and joints shall be mortar tight and supported to achieve safe performance during construction, concrete placement, and form removal. The Contractor shall continuously monitor the alignment and stability of the forms during all phases to assure the finished product will meet the required surface class specified in paragraph FORMS AND FORM LINERS and tolerances specified in paragraph DESIGN REQUIREMENTS. Failure of any supporting surface either due to surface texture, deflection or form collapse shall be the responsibility of the Contractor as will the replacement or correction of unsatisfactory surfaces. Forms shall not be re-used if there is any evidence of defects which would impair the quality of the resulting concrete surface. All surfaces of used forms shall be cleaned of mortar and any other foreign material before reuse.

3.1.2 Chamfering

All exposed joints, edges and external corners shall be chamfered by molding placed in the forms unless the drawings specifically state that chamfering is to be omitted or as otherwise specified. All corners shall be smooth and free of burrs, holes, gaps or roughness that may damage the concrete surface upon removal of the form.

3.1.3 Coating

Forms for exposed or painted surfaces shall be coated with form oil or a form-release agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's instructions. Forms for unexposed surfaces may be wet with water in lieu of coating immediately before placing concrete, except that, in cold weather when freezing temperatures are anticipated, coating shall be mandatory. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be removed before placing concrete.

3.2 FORM REMOVAL

3.2.1 General

Forms shall not be removed without approval, and all removal shall be accomplished in a manner which will prevent injury to concrete. Forms shall not be removed before the expiration of the minimum time indicated below, except as otherwise directed or specifically authorized. The minimal time required for concrete to reach a strength adequate for removal of formwork without risking the safety of workers or the quality of the concrete depends on a number of factors including, but not limited to, ambient temperature, concrete lift heights, type and amount of concrete admixture, and type and amount of cementitious material in the concrete. It is the responsibility of the Contractor to consider all applicable factors and leave the forms in place until it is safe to remove them. In any case forms shall not be removed unless the minimum time and minimum compressive strength requirements below are met, except as otherwise directed or specifically authorized. When conditions are such as to justify the requirement, forms will be required to remain in place for a longer period. All removal shall be accomplished in a manner which will prevent damage to the concrete and ensure the complete safety of the structure.

3.2.2 Formwork

Removal of the forms shall be in a manner to insure complete safety of the structure. Supporting-forms shall not be removed until structural members have acquired sufficient strength support safely their own weight and any construction and/or storage load to which they may be subjected. Forms shall not be removed before the expiration of the minimum time indicated hereafter, except as otherwise directed or specifically authorized:

Non-Supporting Forms	24 hours
Supporting Forms	72 hours

The Contractor may elect to remove the forms at a period less than the time specified herein. The Contractor may remove the forms, both supported and unsupported, after 16 hours provided the following conditions are met. The Contractor will do a structural analysis of the members to insure that strengths suitable for form removal have been reached. This analysis will be performed by a licensed structural engineer and will include the results of short term compressive and flexural strength tests. Test results and analysis will indicate that the concrete in the forms has compressive and flexural strength sufficiently higher than the minimum required for form removal. Any early removal of the form shall not relieve the Contractor from the requirement for supplying core-locs free of cracks. The core-locs will be protected to insure they are not subjected to any loads, either during construction or storage, which may damage them. When conditions on the work are such as to justify the requirement, forms will be required to remain in place for longer periods.

3.3 INSPECTION

Forms and embedded items shall be inspected in sufficient time prior to each concrete placement by the Contractor in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

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CAST-IN-PLACE STRUCTURAL CONCRETE

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

ACI INTERNATIONAL (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214.3R	(1988) Simplified Version of the Recommended Practice for Evaluation of Strength Test Results
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1995) Building Code Requirements for Reinforced Concrete and Commentary

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 182	(1991) Burlap Cloth Made From Jute or Kenaf
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregate
ASTM C 39	(1994) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(1994) Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
ASTM C 78	(1994) Flexural Strength of Concrete

	(Using Simple Beam With Third-Point Loading)
ASTM C 94	(1996) Ready-Mixed Concrete
ASTM C 136	(1995a) Sieve Analysis of Fine and Coarse Aggregates
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1995) Portland Cement
ASTM C 171	(1995) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 940	(1989) Expansion and Bleeding of Freshly Mixed Grouts for Preplaced-Aggregate Concrete in the Laboratory
ASTM C 1017	(1992) Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C 1059	(1991) Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1995b) Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation
ASTM C 1116	(1991) Fiber-Reinforced Concrete and Shotcrete
ASTM D 75	(1987; R 1992) Sampling Aggregates

CORPS OF ENGINEERS (COE)

COE CRD-C 104	(1980) Method of Calculation of the Fineness Modulus of Aggregate
COE CRD-C 400	(1963) Requirements for Water for Use in

Mixing or Curing Concrete

COE CRD-C 521

(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44

(1995) NIST Handbook 44: Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices

NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA TMMB-01

(1992) Truck Mixer Agitator and Front Discharge Concrete Carrier Standards of the Truck Mixer Manufacturers Bureau

NRMCA CPMB 100

(1990) Concrete Plant Standards

NRMCA QC 3

(1984) Quality Control Manual: Section 3, Plant Certifications Checklist: Certification of Ready Mixed Concrete Production Facilities

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-03 Product Data

Synthetic Reinforcing Fiber

SD-06 Test Reports

Testing and Inspection for Contractor Quality Control

Certified copies of laboratory test reports, including mill tests and all other test data, for portland cement, blended cement, pozzolan, silica fume, aggregate, admixtures, and curing compound proposed for use on this project.

SD-07 Certificates

Mixture Proportions

The results of trial mixture design studies along with a statement giving the maximum nominal coarse aggregate size and the proportions of ingredients that will be used in the manufacture of

each strength or class of concrete including underwater concrete, at least 14 days prior to commencing concrete placing operations. Aggregate weights shall be based on the saturated surface dry condition. The statement shall be accompanied by test results from an approved independent commercial testing laboratory, showing that mixture design studies have been made with materials proposed for the project and that the proportions selected will produce concrete of the qualities indicated. No substitutions shall be made in the materials used in the mixture design studies without additional tests to show that the quality of the concrete is satisfactory.

Qualifications

Written documentation for Contractor Quality Control personnel.

Work Plan

The Contractor shall provide a Work Plan detailing the procedures proposed for the accomplishment of the Underwater Toe Trench Tremie Concrete Operation. Work plan shall also include the Contractor's proposed system for the flexible forming system. The procedures shall provide for safe conduct of the work, use of proper equipment and materials, and techniques for toe and tremie concrete placement at the work site exposed to ocean waves and currents. The Contractor is responsible for providing barriers required to protect the underwater concrete from washout or segregation or damage by wave action and/or underwater currents.

1.2 QUALIFICATIONS

Contractor Quality Control personnel assigned to concrete construction shall be American Concrete Institute (ACI) Certified Workmen in one of the following grades or shall have written evidence of having completed similar qualification programs:

Concrete Field Testing Technician, Grade I
 Concrete Laboratory Testing Technician, Grade I or II
 Concrete Construction Inspector, Level II

The foreman or lead journeyman of the flatwork finishing crew shall have similar qualification for ACI Concrete Flatwork Technician/Finisher or equal, with written documentation.

1.3 GENERAL REQUIREMENTS

1.3.1 Tolerances

Except as otherwise specified herein, tolerances for concrete batching, mixture properties, and construction as well as definition of terms and application practices shall be in accordance with ACI 117/117R.

1.3.2 Strength Requirements and w/c Ratio

1.3.2.1 Strength Requirements

Specified compressive strength (f'c) shall be as follows:

<u>Compressive Strength</u>	<u>Structure or Portion of Structure</u>
4,000 psi at 28 days	Concrete Crest Cap
3,000 psi at 28 days	Underwater Toe Trench Tremie Concrete

Concrete made with high-early strength cement shall have a 7-day strength equal to the specified 28-day strength for concrete made with Type I or II portland cement. Compressive strength shall be determined in accordance with ASTM C 39.

- a. Evaluation of Concrete Compressive Strength. Compressive strength specimens (6 by 12 inch cylinders) shall be fabricated by the Contractor and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. The strength of the concrete will be considered satisfactory so long as the average of all sets of three consecutive test results equals or exceeds the specified compressive strength f'c and no individual test result falls below the specified strength f'c by more than 500 psi. A "test" is defined as the average of two companion cylinders, or if only one cylinder is tested, the results of the single cylinder test. Additional analysis or testing, including taking cores and/or load tests may be required at the Contractor's expense when the strength of the concrete in the structure is considered potentially deficient.
- b. Investigation of Low-Strength Compressive Test Results. When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 500 psi or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the strength of the structure. Concrete in the area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement. Non-destructive tests (tests other than test cylinders or cores) shall not be used as a basis for acceptance or rejection. The Contractor shall perform the coring and repair the holes. Cores will be tested by the Government.
- c. Load Tests. If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of

the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318/318R. Concrete work evaluated by structural analysis or by results of a load test as being under strength shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies shall be performed by and at the expense of the Contractor and must be approved by the Contracting Officer, except that if all concrete is found to be in compliance with the drawings and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.3.2.2 Water-Cement Ratio

Maximum water-cement ratio (w/c) for normal weight concrete shall be as follows:

WATER-CEMENT RATIO, BY WEIGHT	STRUCTURE OR PORTION OF STRUCTURE
0.45	Concrete Crest Cap
0.5	Underwater Toe Trench Tremie

Underwater Toe Trench Tremie concrete shall have minimum 7 sacks of cement per cubic yards of concrete. These w/c's may cause higher strengths than that required above for compressive or flexural strength. The maximum w/c required will be the equivalent w/c as determined by conversion from the weight ratio of water to cement plus pozzolan and silica fume, by the weight equivalency method as described in ACI 211.1. In the case where silica fume is used, the weight of the silica fume shall be included in the equations of ACI 211.1 for the term P which is used to denote the weight of pozzolan.

1.3.3 Slump

Slump of the concrete, as delivered to the point of placement into the forms, shall be within the following limits. Slump shall be determined in accordance with ASTM C 143.

Structural Element	Slump Minimum	Maximum
Cast-In-Place Concrete unless noted otherwise	2 in.	4 in.
Any structural concrete approved for placement by pumping:		
At pump	2 in.	6 in.
At discharge of line	1 in.	4 in.
Underwater Toe Trench Tremie	3.5 in.	4.5 in.

Contractor is permitted to use a plasticizing admixture conforming to ASTM

C 1017 or when a Type D or G high range water reducing admixture conforming to ASTM C 494 is permitted to increase slump of concrete. Contractor will submit his proposed method to the Contracting Officer for review and acceptance before placing tremie concrete (to include identification of any proposed admixtures).

1.3.4 Concrete Temperature

The temperature of the concrete as delivered shall not exceed 90 degrees F.

1.3.5 Size of Coarse Aggregate

The largest feasible Nominal Maximum Size Aggregate (NMSA) specified in paragraph AGGREGATES shall be used in each placement. However, nominal maximum size of aggregate shall not exceed any of the following: three-fourths of the minimum cover for reinforcing bars, three-fourths of the minimum clear spacing between reinforcing bars, one-fifth of the narrowest dimension between sides of forms, or one-third of the thickness of slabs or toppings.

1.3.6 Special Properties and Products

Concrete may contain admixtures other than air entraining agents, such as water reducers, superplasticizers, or set retarding agents to provide special properties to the concrete, if specified or approved. Any of these materials to be used on the project shall be used in the mix design studies.

1.4 MIXTURE PROPORTIONS

Concrete shall be composed of portland cement, other cementitious and pozzolanic materials as specified, aggregates, water and admixtures as specified.

1.4.1 Proportioning Studies for Normal Weight Concrete

Trial design batches, mixture proportioning studies, and testing requirements for various classes and types of concrete specified shall be the responsibility of the Contractor. Mixture proportions shall be based on compressive strength as determined by test specimens fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 39. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use in the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportions, consistencies, and air content suitable for the work shall be made based on methodology described in ACI 211.1, using at least three different water-cement ratios for each type of mixture, which will produce a range of strength encompassing those required for each class and type of concrete required on the project. The maximum water-cement ratios required in the paragraph Maximum Allowable w/c Ratio will be the equivalent water-cement ratio as determined by conversion from the weight ratio of water to cement plus pozzolan, silica fume, and Ground Granulated Blast Furnace slag (GGBF slag) by the weight equivalency method as described in ACI 211.1.

Laboratory trial mixtures shall be designed for maximum permitted slump and air content. Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any conveying or placing method proposed which requires special properties and for concrete to be placed in unusually difficult placing locations. The temperature of concrete in each trial batch shall be reported. For each water-cement ratio, at least three test cylinders for each test age shall be made and cured in accordance with ASTM C 192. They shall be tested at 7 and 28 days in accordance with ASTM C 39. From these test results, a curve shall be plotted showing the relationship between water-cement ratio and strength for each set of trial mix studies. In addition, a curve shall be plotted showing the relationship between 7 day and 28 day strengths. Each mixture shall be designed to promote easy and suitable concrete placement, consolidation and finishing, and to prevent segregation and excessive bleeding.

1.4.2 Average Compressive Strength Required for Mixtures

The mixture proportions selected during mixture design studies shall produce a required average compressive strength (f'_{cr}) exceeding the specified compressive strength (f'_c) by the amount indicated below. This required average compressive strength, f'_{cr} , will not be a required acceptance criteria during concrete production. However, whenever the daily average compressive strength at 28 days drops below f'_{cr} during concrete production, or daily average 7-day strength drops below a strength correlated with the 28-day f'_{cr} , the mixture shall be adjusted, as approved, to bring the daily average back up to f'_{cr} . During production, the required f'_{cr} shall be adjusted, as appropriate, based on the standard deviation being attained on the job.

1.4.2.1 Computations from Test Records

Where a concrete production facility has test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected; shall represent concrete produced to meet a specified strength or strengths (f'_c) within 1,000 psi of that specified for proposed work; and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two cylinders made from the same sample of concrete and tested at 28 days. Required average compressive strength f'_{cr} used as the basis for selection of concrete proportions shall be the larger of the equations that follow using the standard deviation as determined above:

$$f'_{cr} = f'_c + 1.345 \text{ where units are in MPa}$$

$$f'_{cr} = f'_c + \text{where units are in psi}$$

$$f'_{cr} = f'_c + 2.335 - 3.45 \text{ where units are in MPa}$$

$f'_{cr} = f'_c + 2.33S - 500$ where units are in psi

Where S = standard deviation

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

NUMBER OF TESTS	MODIFICATION FACTOR FOR STANDARD DEVIATION
15	1.16
20	1.08
25	1.03
30 or more	1.00

1.4.2.2 Computations Without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength f'_{cr} shall be determined as follows:

1.5 STORAGE OF MATERIALS

Cement and other cementitious materials shall be stored in weathertight buildings, bins, or silos which will exclude moisture and contaminants and keep each material completely separated. Aggregate stockpiles shall be arranged and used in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Aggregate shall not be stored directly on ground unless a sacrificial layer is left undisturbed. Reinforcing bars and accessories shall be stored above the ground on platforms, skids or other supports. Other materials shall be stored in such a manner as to avoid contamination and deterioration. Admixtures which have been in storage at the project site for longer than 6 months shall not be used unless retested and proven to meet the specified requirements. Materials shall be capable of being accurately identified after bundles or containers are opened.

1.6 GOVERNMENT ASSURANCE INSPECTION AND TESTING

Day-to day inspection and testing shall be the responsibility of the Contractor Quality Control (CQC) staff. However, representatives of the Contracting Officer can and will inspect construction as considered appropriate and will monitor operations of the Contractor's CQC staff. Government inspection or testing will not relieve the Contractor of any of his CQC responsibilities.

1.6.1 Materials

The Government may sample and test aggregates, cementitious materials, other materials, and concrete to determine compliance with the

specifications as considered appropriate. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of batching in accordance with ASTM D 75. Other materials will be sampled from storage at the jobsite or from other locations as considered appropriate. Samples may be placed in storage for later testing when appropriate.

1.6.2 Fresh Concrete

Fresh concrete will be sampled as delivered in accordance with ASTM C 172 and tested in accordance with these specifications, as considered necessary.

1.6.3 Hardened Concrete

Tests on hardened concrete will be performed by the Government when such tests are considered necessary.

1.6.4 Inspection

Concrete operations may be tested and inspected by the Government as the project progresses. Failure to detect defective work or material will not prevent rejection later when a defect is discovered nor will it obligate the Government for final acceptance.

PART 2 PRODUCTS

2.1 CEMENTITIOUS MATERIALS

Cementitious Materials shall be portland cement, and shall conform to appropriate specifications listed below. Use of cementitious materials in concrete which will have surfaces exposed in the completed structure shall be restricted so there is no change in color, source, or type of cementitious material.

2.1.1 Portland Cement

ASTM C 150, Type II.

2.2 AGGREGATES

Aggregates shall conform to the following.

2.2.1 Fine Aggregate

Fine aggregate shall conform to the quality and gradation requirements of ASTM C 33.

2.2.2 Coarse Aggregate

Coarse aggregate shall conform to ASTM C 33, Class 5S, Size Designation 67.

2.3 CHEMICAL ADMIXTURES

Chemical admixtures, when required or permitted, shall conform to the appropriate specification listed. Admixtures shall be furnished in liquid form and of suitable concentration for easy, accurate control of dispensing.

2.3.1 Water-Reducing or Retarding Admixture

ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive and flexural strength tests are waived.

2.3.2 High-Range Water Reducer

ASTM C 494, Type F or G, except that the 6-month and 1-year strength requirements are waived. The admixture shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.3.3 Anti-Washout Admixture

Anti-washout admixture shall be used in underwater toe tremic concrete. Anti-washout admixture shall have no retarding effect on the concrete setting time. Washout resistance per Army Corps of Engineers CRD-C61, "Test Method for Determining the Resistance of Freshly Mixed Concrete to Washing Out in Water." Placed concrete shall be cohesive and homogenous throughout, resisting segregation. Dosage of anti-washout admixture shall be as determined by admixture manufacturer. Other admixtures used in the underwater toe concrete mix shall be compatible with the anti-washout admixture. As a compatible accelerator admixture may be used to better project the concrete from wash out by wave action and under currents.

2.3.4 Other Chemical Admixtures

Chemical admixtures for use in producing flowing concrete, including underwater application for tremie concrete, shall comply with ASTM C 1017, Type I or II. These admixtures shall be used only when approved in writing, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan and upon performance of separate mixture design studies.

2.4 CURING MATERIALS

2.4.1 Impervious-Sheet

Impervious-sheet materials shall conform to ASTM C 171, type optional, except, that polyethylene sheet shall not be used.

2.4.2 Burlap and Cotton Mat

Burlap and cotton mat used for curing shall conform to AASHTO M 182.

2.5 WATER

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400.

2.6 LATEX BONDING AGENT

Latex agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.7 EPOXY RESIN

Epoxy resins for use in repairs shall conform to ASTM C 881, Type IV, Grade 2. Class as appropriate to the existing ambient and surface temperatures.

2.8 FLEXIBLE FORMING SYSTEM

Flexible forming system shall be capable of containing concrete during placement. Flexible formwork shall be used to form concrete cap that abuts against the top-most layer of core-loc units. When required, additional supports shall be installed to reinforce the forming system.

2.9 Fiber-Reinforced Concrete

In addition to the requirements specified above, fiber reinforced concrete shall be provided in accordance with ASTM C 1116 Type III, synthetic fiber reinforced concrete, and as follows. Synthetic reinforcing fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. A minimum of 1.5 pounds of fibers per cubic yard of concrete shall be used. Fibers shall be added at the batch plant. Fiber reinforced concrete shall be used in areas indicated on the drawings.

PART 3 EXECUTION

3.1 PREPARATION FOR PLACING

Before commencing concrete placement, the following shall be performed. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03110 FORMWORK FOR CONCRETE CORE-LOC. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material. Equipment for consolidating concrete shall be at the placing site and in proper working order. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition and in sufficient amount for the entire placement. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage cracking or other damaging drying of the concrete.

3.1.1 Foundations

3.1.1.1 Preparation of Rock

Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, mud, drummy rock, coating, debris, and loose, semidetached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, and may be filled with clean gravel as determined by the Contracting Officer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.

3.2 CONCRETE PRODUCTION

3.2.1 Batching, Mixing, and Transporting Concrete

Concrete shall either be batched and mixed onsite or shall be furnished from a ready-mixed concrete plant. Ready-mixed concrete shall be batched, mixed, and transported in accordance with ASTM C 94, except as otherwise specified. Truck mixers, agitators, and nonagitating transporting units shall comply with NRMCA TMMB-01. Ready-mix plant equipment and facilities shall be certified in accordance with NRMCA QC 3. Approved batch tickets shall be furnished for each load of ready-mixed concrete. **All concrete shall conform to the following subparagraphs.**

3.2.1.1 General

The batching plant shall be located on site in the general area indicated on the drawings or off site close to the project. The batching plant shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required.

3.2.1.2 Batching Equipment

The batching controls shall be semiautomatic or automatic, as defined in NRMCA CPMB 100. A semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with accurate recorder or recorders that meet the requirements of NRMCA CPMB 100. The weight of water and admixtures shall be recorded if batched by weight. Separate bins or compartments shall be provided for each size group of aggregate and type of cementitious material, to prevent intermingling at any time. Aggregates shall be weighed either in separate weigh batchers with individual scales or, provided the smallest size is batched first, cumulatively in one weigh batcher on one scale. Aggregate shall not be weighed in the same batcher with cementitious material. If both portland cement and other cementitious

material are used, they may be batched cumulatively, provided that the portland cement is batched first. Water may be measured by weight or volume. Water shall not be weighed or measured cumulatively with another ingredient. Filling and discharging valves for the water metering or batching system shall be so interlocked that the discharge valve cannot be opened before the filling valve is fully closed. Piping for water and for admixtures shall be free from leaks and shall be properly valved to prevent backflow or siphoning. Admixtures shall be furnished as a liquid of suitable concentration for easy control of dispensing. An adjustable, accurate, mechanical device for measuring and dispensing each admixture shall be provided. Each admixture dispenser shall be interlocked with the batching and discharging operation of the water so that each admixture is separately batched and individually discharged automatically in a manner to obtain uniform distribution throughout the water as it is added to the batch in the specified mixing period. When use of truck mixers makes this requirement impractical, the admixture dispensers shall be interlocked with the sand batchers. Different admixtures shall not be combined prior to introduction in water and shall not be allowed to intermingle until in contact with the cement. Admixture dispensers shall have suitable devices to detect and indicate flow during dispensing or have a means for visual observation. The plant shall be arranged so as to facilitate the inspection of all operations at all times. Suitable facilities shall be provided for obtaining representative samples of aggregates from each bin or compartment, and for sampling and calibrating the dispensing of cementitious material, water, and admixtures. Filling ports for cementitious materials bins or silos shall be clearly marked with a permanent sign stating the contents.

3.2.1.3 Scales

The weighing equipment shall conform to the applicable requirements of CPMB Concrete Plant Standard, and of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. The tests shall be made at the specified frequency in the presence of a Government inspector. The weighing equipment shall be arranged so that the plant operator can conveniently observe all dials or indicators.

3.2.1.4 Batching Tolerances

(A) Tolerances with Weighing Equipment

MATERIAL	PERCENT OF REQUIRED WEIGHT
Cementitious materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical admixture	0 to plus 6

(B) Tolerances with Volumetric Equipment

For volumetric batching equipment used for water and admixtures, the following tolerances shall apply to the required volume of material being batched:

MATERIAL	PERCENT OF REQUIRED MATERIAL
Water:	plus or minus 1 percent
Chemical admixtures:	0 to plus 6 percent

3.2.1.5 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the weights of the materials being batched.

3.2.1.6 Concrete Mixers

Mixers shall be stationary mixers or truck mixers. Mixers shall be capable of combining the materials into a uniform mixture and of discharging this mixture without segregation. The mixers shall not be charged in excess of the capacity recommended by the manufacturer. The mixers shall be operated at the drum or mixing blade speed designated by the manufacturer. The mixers shall be maintained in satisfactory operating condition, and the mixer drums shall be kept free of hardened concrete. Should any mixer at any time produce unsatisfactory results, its use shall be promptly discontinued until it is repaired.

3.2.1.7 Stationary Mixers

Concrete plant mixers shall be drum-type mixers of tilting, nontilting, horizontal-shaft, or vertical-shaft type, or shall be pug mill type and shall be provided with an acceptable device to lock the discharge mechanism until the required mixing time has elapsed. The mixing time and uniformity shall conform to all the requirements in ASTM C 94 applicable to central-mixed concrete.

3.2.1.8 Truck Mixers

Truck mixers, the mixing of concrete therein, and concrete uniformity shall conform to the requirements of ASTM C 94. A truck mixer may be used either for complete mixing (transit-mixed) or to finish the partial mixing done in a stationary mixer (shrink-mixed). Each truck shall be equipped with two counters from which it is possible to determine the number of revolutions at mixing speed and the number of revolutions at agitating speed. Water shall not be added at the placing site unless specifically approved; and in no case shall it exceed the specified w/c. Any such water shall be injected at the base of the mixer, not at the discharge end.

3.3 TRANSPORTING CONCRETE TO PROJECT SITE

Concrete shall be transported to the placing site in truck mixers, agitators, nonagitating transporting equipment conforming to NRMCA TMMB-01 or by approved pumping equipment conveyors.

3.4 CONVEYING CONCRETE ON SITE

Concrete shall be conveyed from mixer or transporting unit to forms as rapidly as possible and within the time interval specified by methods which will prevent segregation or loss of ingredients using following equipment. Conveying equipment shall be cleaned before each placement.

3.4.1 Buckets

The interior hopper slope shall be not less than 58 degrees from the horizontal, the minimum dimension of the clear gate opening shall be at least 5 times the nominal maximum-size aggregate, and the area of the gate opening shall not be less than 2 square feet. The maximum dimension of the gate opening shall not be greater than twice the minimum dimension. The bucket gates shall be essentially grout tight when closed and may be manually, pneumatically, or hydraulically operated except that buckets larger than 2 cubic yards shall not be manually operated. The design of the bucket shall provide means for positive regulation of the amount and rate of deposit of concrete in each dumping position.

3.4.2 Transfer Hoppers

Concrete may be charged into nonagitating hoppers for transfer to other conveying devices. Transfer hoppers shall be capable of receiving concrete directly from delivery vehicles and shall have conical-shaped discharge features. The transfer hopper shall be equipped with a hydraulically operated gate and with a means of external vibration to effect complete discharge. Concrete shall not be held in nonagitating transfer hoppers more than 30 minutes.

3.4.3 Trucks

Truck mixers operating at agitating speed or truck agitators used for transporting plant-mixed concrete shall conform to the requirements of ASTM C 94. Nonagitating equipment shall be used only for transporting plant-mixed concrete over a smooth road and when the hauling time is less than 15 minutes. Bodies of nonagitating equipment shall be smooth, watertight, metal containers specifically designed to transport concrete, shaped with rounded corners to minimize segregation, and equipped with gates that will permit positive control of the discharge of the concrete.

3.4.4 Chutes

When concrete can be placed directly from a truck mixer, agitator, or nonagitating equipment, the chutes normally attached to this equipment by the manufacturer may be used. A discharge deflector shall be used when required by the Contracting Officer. Separate chutes and other similar equipment will not be permitted for conveying concrete.

3.4.5 Belt Conveyors

Belt conveyors shall be designed and operated to assure a uniform flow of concrete from mixer to final place of deposit without segregation of

ingredients or loss of mortar and shall be provided with positive means, such as discharge baffle or hopper, for preventing segregation of the concrete at the transfer points and the point of placing. Belt conveyors shall be constructed such that the idler spacing shall not exceed 36 inches. The belt speed shall be a minimum of 300 feet per minute and a maximum of 750 feet per minute. If concrete is to be placed through installed horizontal or sloping reinforcing bars, the conveyor shall discharge concrete into a pipe or elephant truck that is long enough to extend through the reinforcing bars.

3.4.6 Concrete Pumps

Concrete may be conveyed by positive displacement pump when approved. The pumping equipment shall be piston or squeeze pressure type; pneumatic placing equipment shall not be used. The pipeline shall be rigid steel pipe or heavy-duty flexible hose. The inside diameter of the pipe shall be at least 3 times the nominal maximum-size coarse aggregate in the concrete mixture to be pumped but not less than 4 inches. Aluminum pipe shall not be used.

3.5 PLACING CONCRETE

Mixed concrete shall be discharged within 1-1/2 hours or before the mixer drum has revolved 300 revolutions, whichever comes first after the introduction of the mixing water to the cement and aggregates. When the concrete temperature exceeds 85 degrees F, the time shall be reduced to 45 minutes. Concrete shall be placed within 15 minutes after it has been discharged from the transporting unit. Concrete shall be handled from mixer or transporting unit to forms in a continuous manner until the approved unit of operation is completed. Adequate scaffolding, ramps and walkways shall be provided so that personnel and equipment are not supported by in-place reinforcement. Placing will not be permitted when the sun, heat, wind, or limitations of facilities furnished by the Contractor prevent proper consolidation, finishing and curing. Sufficient placing capacity shall be provided so that concrete can be kept free of cold joints.

3.5.1 Depositing Concrete

Concrete shall be deposited as close as possible to its final position in the forms, and there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it will be effectively consolidated in horizontal layers not more than 12 inches thick, except that all slabs shall be placed in a single layer. Concrete to receive other construction shall be screeded to the proper level. Concrete shall be deposited continuously in one layer or in layers so that fresh concrete is deposited on in-place concrete that is still plastic. Fresh concrete shall not be deposited on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section. Concrete that has surface dried, partially hardened, or contains foreign material shall not be used. When temporary spreaders are used in the forms, the spreaders shall be removed as their service becomes unnecessary. Concrete shall not be placed in slabs over columns

and walls until concrete in columns and walls has been in-place at least two hours or until the concrete begins to lose its plasticity. Concrete for beams, girders, brackets, column capitals, haunches, and drop panels shall be placed at the same time as concrete for adjoining slabs.

3.5.2 Consolidation

Immediately after placing, each layer of concrete shall be consolidated by internal vibrators, except for slabs 4 inches thick or less. The vibrators shall at all times be adequate in effectiveness and number to properly consolidate the concrete; a spare vibrator shall be kept at the jobsite during all concrete placing operations. The vibrators shall have a frequency of not less than 10,000 vibrations per minute, an amplitude of at least 0.025 inch, and the head diameter shall be appropriate for the structural member and the concrete mixture being placed. Vibrators shall be inserted vertically at uniform spacing over the area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator so that the area being vibrated will overlap the adjacent just-vibrated area by a reasonable amount. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding layer if there is such. Vibrator shall be held stationary until the concrete is consolidated and then vertically withdrawn slowly while operating. Form vibrators shall not be used unless specifically approved and unless forms are constructed to withstand their use. Vibrators shall not be used to move concrete within the forms. Slabs 4 inches and less in thickness shall be consolidated by properly designed vibrating screeds or other approved technique. Excessive vibration of lightweight concrete resulting in segregation or flotation of coarse aggregate shall be prevented. Frequency and amplitude of vibrators shall be determined in accordance with COE CRD-C 521. Grate tampers ("jitterbugs") shall not be used.

3.5.3 Hot Weather Requirements

When the ambient temperature during concrete placing is expected to exceed 85 degrees F, the concrete shall be placed and finished with procedures previously submitted and as specified herein. The concrete temperature at time of delivery to the forms shall not exceed the temperature shown in the table below when measured in accordance with ASTM C 1064. Cooling of the mixing water or aggregates or placing concrete in the cooler part of the day may be required to obtain an adequate placing temperature. A retarder may be used, as approved, to facilitate placing and finishing. Steel forms and reinforcements shall be cooled as approved prior to concrete placement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

Maximum Allowable Concrete Placing Temperature

Relative Humidity, Percent, During Time of Concrete Placement	Maximum Allowable Concrete Temperature Degrees
Greater than 60	90 F
40-60	85 F
Less than 40	80 F

3.5.4 Prevention of Plastic Shrinkage Cracking

During hot weather with low humidity, and particularly with appreciable wind, as well as interior placements when space heaters produce low humidity, the Contractor shall be alert to the tendency for plastic shrinkage cracks to develop and shall institute measures to prevent this. Particular care shall be taken if plastic shrinkage cracking is potentially imminent and especially if it has developed during a previous placement. Periods of high potential for plastic shrinkage cracking can be anticipated by use of Fig. 2.1.5 of ACI 305R. In addition the concrete placement shall be further protected by erecting shades and windbreaks and by applying fog sprays of water, sprinkling, ponding or wet covering. Plastic shrinkage cracks that occur shall be filled by injection of epoxy resin as directed, after the concrete hardens. Plastic shrinkage cracks shall never be troweled over or filled with slurry.

3.5.5 Placing Flowable Concrete

If a plasticizing admixture conforming to ASTM C 1017 is used or if a Type F or G high range water reducing admixture is permitted to increase the slump, the concrete shall meet all requirements of paragraph GENERAL REQUIREMENTS. Extreme care shall be used in conveying and placing the concrete to avoid segregation. Consolidation and finishing shall meet all requirements of paragraphs Placing Concrete, Finishing Formed Surfaces, and Finishing Unformed Surfaces. No relaxation of requirements to accommodate flowable concrete will be permitted.

3.5.6 Placing Concrete Underwater

Concrete shall be deposited in water by a tremie or concrete pump. The methods and equipment used shall be submitted to the Government for information only. Concrete buckets shall not be used for underwater placement of concrete except to deliver concrete to the tremie. The tremie shall be watertight and sufficiently large to permit a free flow of concrete. The concrete shall be deposited so that it enters the mass of the previously placed concrete from within, displacing water with a minimum disturbance to the surface of the concrete. The discharge end of the pump line or tremie shaft shall be kept continuously submerged in the concrete. The underwater seal at start of placing shall not produce undue turbulence in the water. The tremie shaft shall be kept full of concrete to a point well above the water surface. Placement shall proceed without interruption

until the concrete has been brought to the required height. The tremie shall not be moved horizontally during a placing operation, and a sufficient number of tremies shall be provided so that the maximum horizontal flow of concrete will be limited to 5 m.

3.6 FINISHING FORMED SURFACES

Finishing of formed surfaces shall be as specified herein. Except for major defects, as defined hereinafter, surface defects shall be repaired as specified herein within 24 hours after forms are removed. Repairs of the so-called "plaster-type" will not be permitted in any location. Tolerances of formed surfaces shall conform to the requirements of ACI 117/117R. These tolerances apply to the finished concrete surface, not to the forms themselves; forms shall be set true to line and grade. Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter shall be repaired as specified in paragraph Damp-Pack Mortar Repair. Defects whose surface diameter is greater than their depth shall be repaired as specified in paragraph Repair of Major Defects. Repairs shall be finished flush with adjacent surfaces and with the same surface texture. The cement used for all repairs shall be a blend of job cement with white cement proportioned so that the final color after curing and aging will be the same as the adjacent concrete. Concrete with excessive honeycomb, or other defects which affect the strength of the member, will be rejected. Repairs shall be demonstrated to be acceptable and free from cracks or loose or drummy areas at the completion of the contract. Repairs not meeting these requirements will be rejected and shall be replaced.

3.6.1 Class C and Class D Finish

Fins, ravelings, and loose material shall be removed, and, FORMWORK, holes left by removal of form ties shall be reamed and filled. Honeycomb and other defects more than 1/2 inch deep or more than 2 inches in diameter shall be repaired. Defects more than 2 inches in diameter shall be cut back to sound concrete, but in all cases at least 1 inch.

3.7 REPAIRS

3.7.1 Damp-Pack Mortar Repair

Form tie holes requiring repair and other defects whose depth is at least as great as their surface diameter but not over 4 inches shall be repaired by the damp-pack mortar method. Form tie holes shall be reamed and other similar defects shall be cut out to sound concrete. The void shall then be thoroughly cleaned, thoroughly wetted, brush-coated with a thin coat of neat cement grout and filled with mortar. Mortar shall be a stiff mix of 1 part portland cement to 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water. Only sufficient water shall be used to produce a mortar which, when used, will stick together on being molded into a ball by a slight pressure of the hands and will not exude water but will leave the hands damp. Mortar shall be mixed and allowed to stand for 30 to 45 minutes before use with remixing performed immediately prior to use. Mortar shall be thoroughly tamped in place in thin layers using a hammer and hardwood block. Holes passing entirely through walls shall be

completely filled from the inside face by forcing mortar through to the outside face. All holes shall be packed full. Damp-pack repairs shall be moist cured for at least 48 hours.

3.7.2 Repair of Major Defects

Major defects will be considered to be those more than 1/2 inch deep or, for Class D finish, more than 2 inches in diameter. Also included are any defects of any kind whose depth is over 4 inches or whose surface diameter is greater than their depth. Major defects shall be repaired as specified below.

3.7.2.1 Surface Application of Mortar Repair

Defective concrete shall be removed, and removal shall extend into completely sound concrete. Approved equipment and procedures which will not cause cracking or microcracking of the sound concrete shall be used. If reinforcement is encountered, concrete shall be removed so as to expose the reinforcement for at least 2 inches on all sides. All such defective areas greater than 12 square inches shall be outlined by saw cuts at least 1 inch. Defective areas less than 12 square inches shall be outlined by a 1 inch deep cut with a core drill in lieu of sawing. All saw cuts shall be straight lines in a rectangular pattern in line with the formwork panels. After concrete removal, the surface shall be thoroughly cleaned by high pressure washing to remove all loose material. Surfaces shall be kept continually saturated for the first 12 of the 24 hours immediately before placing mortar and shall be damp but not wet at the time of commencing mortar placement. The Contractor, at his option, may use either hand-placed mortar or mortar placed with a mortar gun. If hand-placed mortar is used, the edges of the cut shall be perpendicular to the surface of the concrete. The prepared area shall be brush-coated with a thin coat of neat cement grout. The repair shall then be made using a stiff mortar, preshrunk by allowing the mixed mortar to stand for 30 to 45 minutes and then remixed, thoroughly tamped into place in thin layers. If hand-placed mortar is used, the Contractor shall test each repair area for drumminess by firm tapping with a hammer and shall inspect for cracks, both in the presence of the Contracting Officer's representative, immediately before completion of the contract, and shall replace any showing drumminess or cracking. If mortar placed with a mortar gun is used, the gun shall be a small compressed air-operated gun to which the mortar is slowly hand fed and which applies the mortar to the surface as a high-pressure stream, as approved. Repairs made using shotcrete equipment will not be accepted. The mortar used shall be the same mortar as specified for damp-pack mortar repair. If gun-placed mortar is used, the edges of the cut shall be beveled toward the center at a slope of 1:1. All surface applied mortar repairs shall be continuously moist cured for at least 7 days. Moist curing shall consist of several layers of saturated burlap applied to the surface immediately after placement is complete and covered with polyethylene sheeting, all held closely in place by a sheet of plywood or similar material rigidly braced against it. Burlap shall be kept continually wet.

3.7.2.2 Repair of Deep and Large Defects

Deep and large defects will be those that are more than 6 inches deep and also have an average diameter at the surface more than 18 inches or that are otherwise so identified by the Project Office. Such defects shall be repaired as specified herein or directed, except that defects which affect the strength of the structure shall not be repaired and that portion of the structure shall be completely removed and replaced. Deep and large defects shall be repaired by procedures approved in advance including forming and placing special concrete using applied pressure during hardening. Preparation of the repair area shall be as specified for surface application of mortar. In addition, the top edge (surface) of the repair area shall be sloped at approximately 20 degrees from the horizontal, upward toward the side from which concrete will be placed. The special concrete shall be a concrete mixture with low water content and low slump, and shall be allowed to age 30 to 60 minutes before use. Concrete containing a specified expanding admixture may be used in lieu of the above mixture; the paste portion of such concrete mixture shall be designed to have an expansion between 2.0 and 4.0 percent when tested in accordance with ASTM C 940. A full width "chimney" shall be provided at the top of the form on the placing side to ensure filling to the top of the opening. A pressure cap shall be used on the concrete in the chimney with simultaneous tightening and revibrating the form during hardening to ensure a tight fit for the repair. The form shall be removed after 24 hours and immediately the chimney shall be carefully chipped away to avoid breaking concrete out of the repair; the surface of the repair concrete shall be dressed as required.

3.8 FINISHING UNFORMED SURFACES

The finish of all unformed surfaces shall meet the requirements of paragraph Tolerances in PART 1, when tested as specified herein.

3.8.1 General

In hot weather all requirements of paragraphs Hot Weather Requirements and Prevention of Plastic Shrinkage Cracking shall be met. Unformed surfaces that are not to be covered by additional concrete or backfill shall have a float finish, with additional finishing as specified below, and shall be true to the elevation shown on the drawings. Surfaces to receive additional concrete or backfill shall be brought to the elevation shown on the drawings, properly consolidated, and left true and regular. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tempers or "jitterbugs" shall not be used for any surfaces. The dusting surfaces with dry cement or other materials or the addition of any water during finishing shall not be permitted. If bleedwater is present prior to finishing, the excess water shall be carefully dragged off or removed by absorption with porous materials such as burlap. During finishing operations, extreme care shall be taken to prevent over finishing or working water into the surface; this can cause "crazing" (surface shrinkage cracks which appear after hardening) of the surface. Any surfaces with surfaces which exhibit significant crazing shall be removed and replaced. During finishing operations, surfaces shall be checked with a 10 foot straightedge, applied

in both directions at regular intervals while the concrete is still plastic, to detect high or low areas.

3.8.2 Broomed

The top surface of the concrete cap shall be given a broomed finish. After floating, the surface shall be lightly steel troweled, and then carefully scored by pulling a coarse fiber push-type broom across the surface. Brooming shall be transverse to traffic or at right angles to the slope of the slab. After the end of the curing period, the surface shall be vigorously broomed with a coarse fiber broom to remove all loose or semi-detached particles.

3.9 CURING AND PROTECTION

3.9.1 General

Concrete shall be cured by an approved method for the period of time given below:

All Concrete	7 days
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Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, mechanical injury and damage from rain and flowing water for the duration of the curing period. Materials and equipment needed for adequate curing and protection shall be available and at the site prior to placing concrete. No fire or excessive heat, including welding, shall be permitted near or in direct contact with the concrete at any time. Except for plastic coated burlap, impervious sheeting alone shall not be used for curing.

3.9.2 Moist Curing

Concrete to be moist-cured shall be maintained continuously wet for the entire curing period, commencing immediately after finishing. If water or curing materials used stain or discolor concrete surfaces which are to be permanently exposed, the concrete surfaces shall be cleaned as approved. When wooden forms are left in place during curing, they shall be kept wet at all times. If steel forms are used in hot weather, non-supporting vertical forms shall be broken loose from the concrete soon after the concrete hardens and curing water continually applied in this void. If the forms are removed before the end of the curing period, curing shall be carried out as on unformed surfaces, using suitable materials. Surfaces shall be cured by ponding, by continuous sprinkling, by continuously saturated burlap or cotton mats, or by continuously saturated plastic coated burlap. Burlap and mats shall be clean and free from any contamination and shall be completely saturated before being placed on the concrete. The Contractor shall have an approved work system to ensure that moist curing is continuous 24 hours per day.

3.9.3 Impervious Sheeting

The following concrete surfaces may be cured using impervious sheets: Ribs. However, except for plastic coated burlap, impervious sheeting alone

shall not be used for curing. Impervious-sheet curing shall only be used on horizontal or nearly horizontal surfaces. Surfaces shall be thoroughly wetted and be completely covered with the sheeting. Sheeting shall be at least 18 inches wider than the concrete surface to be covered. Covering shall be laid with light-colored side up. Covering shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. The sheet shall be weighted to prevent displacement so that it remains in contact with the concrete during the specified length of curing. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

3.9.4 Ponding or Immersion

Concrete shall continually immerse throughout the curing period. Water shall not be more than 20 degrees F less than the temperature of the concrete.

3.10 TESTING AND INSPECTION FOR CONTRACTOR QUALITY CONTROL

The Contractor shall perform the inspection and tests described below and, based upon the results of these inspections and tests, shall take the action required and shall submit specified reports. When, in the opinion of the Contracting Officer, the concreting operation is out of control, concrete placement shall cease and the operation shall be corrected. The laboratory performing the tests shall be onsite and shall conform with ASTM C 1077. Materials may be subjected to check testing by the Government from samples obtained at the manufacturer, at transfer points, or at the project site. The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations.

The Contractor shall be responsible for ensuring their laboratory is validated in accordance with the requirements in Section 01451 CONTRACTOR QUALITY CONTROL.

3.10.1 Grading and Corrective Action

3.10.1.1 Fine Aggregate

At least once during each shift when the concrete plant is operating, there shall be one sieve analysis and fitness modulus determination in accordance with ASTM C 136 and COE CRD-C 104 for the fine aggregate or for each fine aggregate if it is batched in more than one size or classification. The location at which samples are taken may be selected by the Contractor as the most advantageous for control. However, the Contractor is responsible for delivering fine aggregate to the mixer within specification limits. When the amount passing on any sieve is outside the specification limits, the fine aggregate shall be immediately resampled and retested. If there is another failure on any sieve, the fact shall immediately reported to the Contracting Officer, concreting shall be stopped, and immediate steps taken to correct the grading.

3.10.1.2 Coarse Aggregate

At least once during each shift in which the concrete plant is operating, there shall be a sieve analysis in accordance with ASTM C 136 for each size of coarse aggregate. The location at which samples are taken may be selected by the Contractor as the most advantageous for production control. However, the Contractor shall be responsible for delivering the aggregate to the mixer within specification limits. A test record of samples of aggregate taken at the same locations shall show the results of the current test as well as the average results of the five most recent tests including the current test. The Contractor may adopt limits for control coarser than the specification limits for samples taken other than as delivered to the mixer to allow for degradation during handling. When the amount passing any sieve is outside the specification limits, the coarse aggregate shall be immediately resampled and retested. If the second sample fails on any sieve, that fact shall be reported to the Contracting Officer. Where two consecutive averages of 5 tests are outside specification limits, the operation shall be considered out of control and shall be reported to the Contracting Officer. Concreting shall be stopped and immediate steps shall be taken to correct the grading.

3.10.2 Quality of Aggregates

Thirty (30) days prior to the start of concrete placement, the Contractor shall perform all tests for aggregate quality required by ASTM C 33. In addition, after the start of concrete placement, the Contractor shall perform tests for aggregate quality at least every three months, and when the source of aggregate or aggregate quality changes. Samples tested after the start of concrete placement shall be taken immediately prior to entering the concrete mixer.

3.10.3 Scales, Batching and Recording

The accuracy of the scales shall be checked by test weights prior to start of concrete operations and at least once every three months. Such tests shall also be made as directed whenever there are variations in properties of the fresh concrete that could result from batching errors. Once a week the accuracy of each batching and recording device shall be checked during a weighing operation by noting and recording the required weight, recorded weight, and the actual weight batched. At the same time, the Contractor shall test and ensure that the devices for dispensing admixtures are operating properly and accurately. When either the weighing accuracy or batching accuracy does not comply with specification requirements, the plant shall not be operated until necessary adjustments or repairs have been made. Discrepancies in recording accuracies shall be corrected immediately.

3.10.4 Batch-Plant Control

The measurement of concrete materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. The amount of air-entraining agent shall be adjusted to control air content

within specified limits. A report shall be preparing indicating type and source of cement used, type and source of pozzolan or slag used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water weights per cubic yard for each class of concrete batched during each day's plant operation.

3.10.5 Concrete Mixture

a. Slump Testing. In addition to slump tests which shall be made when test specimens are fabricated, at least four slump tests shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each 8-hour or less period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government inspector. Test results shall be plotted on control charts which shall at all times be readily available to the Government and shall be submitted weekly. Copies of the current control charts shall be kept in the field by testing crews and results plotted as tests are made. When a single slump test reaches or goes beyond either the upper or lower action limit, a second test shall immediately be made. The results of the two tests shall be averaged and this average used as the slump of the batch to plot on both the control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump and the chart for range, and for determining need for any remedial action. Limits shall be set on separate control charts for slump for each type of mixture. The upper warning limit shall be set at 1/2 inch below the maximum allowable slump specified in paragraph SLUMP in PART 1 for each type of concrete and an upper action limit line and lower action limit line shall be set at the maximum and minimum allowable slumps, respectively, as specified in the same paragraph. The range between each consecutive slump test for each type of mixture shall be plotted on a single control chart for range on which an upper action limit is set at 2 inches. Samples for slump shall be taken at the mixer. However, the Contractor is responsible for delivering the concrete to the placement site at the stipulated slump. If the Contractor's materials or transportation methods cause slump loss between the mixer and the placement site as required by the Contracting Officer, and the slump at the mixer controlled as directed.

b. Slump Corrective Action. Whenever points on the control charts for slump reach the upper warning limit, an adjustment shall immediately be made in the batch weights of water and fine aggregate. The adjustments are to be made so that the total water content does not exceed that amount allowed by the maximum w/c ratio specified, based on aggregates which are in a saturated surface dry condition. When a single slump reaches the upper or lower action limit, no further concrete shall be delivered to the placing site until proper adjustments have been made. Immediately after each adjustment, another test shall be made to verify the correctness of the adjustment. Whenever two consecutive

individual slump tests, made during a period when there was no adjustment of batch weights, produce a point on the control chart for range at or above the upper action limit, the concreting operation shall immediately be halted, and the Contractor shall take appropriate steps to bring the slump under control. Additional slump tests shall be made as directed.

c. Temperature. The temperature of the concrete shall be measured when compressive strength specimens are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data.

d. Strength Specimens. At least one set of test specimens shall be made, for compressive or flexural strength as appropriate, on each different concrete mixture placed during the day for each 500 cubic yards or portion thereof of that concrete mixture placed each day. Additional sets of test specimens shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A truly random (not haphazard) sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified strength per paragraph STRENGTH REQUIREMENTS in Part 1 shall consist of four specimens, two to be tested at 7 days and two at 28 days. A set of test specimens for concrete within a 90-day strength per the same paragraph shall consist of six specimens, two tested at 7 days, two at 28 days, and two at 90 days. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39 for test cylinders and ASTM C 78 for test beams. Results of all strength tests shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength "tests", ("test" as defined in paragraph STRENGTH REQUIREMENTS in Part 1) moving average of last 3 "tests" for strength, and moving average for range for the last 3 "tests" for each mixture. The charts shall be similar to those found in ACI 214.3R.

3.10.6 Inspection Before Placing

Foundations, construction joints, forms, and embedded items shall be inspected by the Contractor in sufficient time prior to each concrete placement in order to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.10.7 Placing

The placing foreman shall supervise placing operations, shall determine that the correct quality of concrete or grout is placed in each location as specified and as directed by the Contracting Officer, and shall be responsible for measuring and recording concrete temperatures and ambient

temperature hourly during placing operations, weather conditions, time of placement, volume placed, and method of placement. The placing foreman shall not permit batching and placing to begin until it has been verified that an adequate number of vibrators in working order and with competent operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.10.8 Vibrators

The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and at least once a month when concrete is being placed. Additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined while the vibrator is operating in concrete with the tachometer being held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two measurements shall be taken, one near the tip and another near the upper end of the vibrator head, and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing. Any vibrator not meeting the requirements of paragraph CONSOLIDATION, shall be immediately removed from service and repaired or replaced.

3.10.9 Curing Inspection

- a. Moist Curing Inspections. At least once each shift, and not less than twice per day on both work and non-work days, an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.
- b. Moist Curing Corrective Action. When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for those areas shall be extended by one (1) day.
- c. Membrane Curing Inspection. No curing compound shall be applied until the Contractor has verified that the compound is properly mixed and ready for spraying. At the end of each operation, the Contractor shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered, shall compute the rate of coverage in square feet per gallon, and shall not whether or not coverage is uniform.
- d. Membrane Curing Corrective Action. When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.
- e. Sheet Curing Inspection. At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using impervious sheets. The condition of the covering and the tightness of the laps and tapes shall be noted

and recorded.

f. Sheet Curing Corrective Action. When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by one (1) day.

3.10.10 Mixer Uniformity

a. Stationary Mixers. Prior to the start of concrete placing and once every 6 months when concrete is being placed, or once for every 75,000 cubic yards of concrete placed, whichever results in the shortest time interval, uniformity of concrete mixing shall be determined in accordance with ASTM C 94.

b. Truck Mixers. Prior to the start of concrete placing and at least once every 6 months when concrete is being placed, uniformity of concrete mixing shall be determined in accordance with ASTM C 94. The truck mixers shall be selected randomly for testing. When satisfactory performance is found in one truck mixer, the performance of mixers of substantially the same design and condition of the blades may be regarded as satisfactory.

c. Mixer Uniformity Corrective Action. When a mixer fails to meet mixer uniformity requirements, either the mixing time shall be increased, batching sequence changed, batch size reduced, or adjustments shall be made to the mixer until compliance is achieved.

3.10.11 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. The Contracting Officer has the right to examine all contractor quality control records.

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SECTION 03310

CONCRETE FOR CORE-LOC

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN CONCRETE INSTITUTE (ACI)

ACI 117/117R	(1990; Errata) Standard Tolerances for Concrete Construction and Materials
ACI 211.1	(1991) Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete
ACI 214	(1977; R 1989) Evaluation of Strength Test Results of Concrete
ACI 214.3R	(1988) Evaluation of Strength Test Results of Concrete
ACI 305R	(1991) Hot Weather Concreting
ACI 318/318R	(1995) Building Code Requirements for Reinforced Concrete and Commentary
ACI 318M/318RM	(1992) Building Code Requirements for Reinforced Concrete (Metric)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C 31	(1991) Making and Curing Concrete Test Specimens in the Field
ASTM C 33	(1993) Concrete Aggregates
ASTM C 39	(1994) Compressive Strength of Cylindrical Concrete Specimens
ASTM C 42	(2003) Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

ASTM C 78	(1994) Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
ASTM C 94	(1994) Ready-Mixed Concrete
ASTM C 143	(1990a) Slump of Hydraulic Cement Concrete
ASTM C 150	(1995) Portland Cement
ASTM C 171	(1992) Sheet Materials for Curing Concrete
ASTM C 172	(1990) Sampling Freshly Mixed Concrete
ASTM C 186	(1994) Standard Test for Heat of Hydration of Hydraulic Cement
ASTM C 192	(1990a) Making and Curing Concrete Test Specimens in the Laboratory
ASTM C 289	(1994) Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
ASTM C 309	(1994) Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C 494	(1992) Chemical Admixtures for Concrete
ASTM C 597	(2002) Test Method for Pulse Velocity Through Concrete
ASTM C 618	(2003) Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
ASTM C 803	(2003) Test Method for Penetration Resistance of Hardened Concrete
ASTM C 805	(1994) Rebound Number of Hardened Concrete
ASTM C 881	(1990) Epoxy-Resin-Base Bonding Systems for Concrete
ASTM C 1059	(1999) Specification for Latex Agents for Bonding Fresh to Hardened Concrete
ASTM C 1064	(1986; R 1993) Temperature of Freshly Mixed Portland Cement Concrete
ASTM C 1077	(1995b) Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

ASTM C 1107	(1991a) Packaged Dry, Hydraulic-Cement Grout (Non-Shrink)
ASTM C 1116	(2003) Specification for Fiber-Reinforced Concrete and Shotcrete
ASTM D 75	(1987; R 1992) Sampling Aggregates

CORPS OF ENGINEERS (COE)

COE CRD-C 318	(1972) Cloth, Burlap, Jute (or Kenaf)
COE CRD-C 400	(1963) Requirements for Water for Use in Mixing or Curing Concrete
COE CRD-C 521	(1981) Standard Test Method for Frequency and Amplitude of Vibrators for Concrete

NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY (NIST)

NIST HB 44	(2000) Specifications, Tolerances, and Other Technical Requirements for Weighing and Measuring Devices
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NATIONAL READY-MIXED CONCRETE ASSOCIATION (NRMCA)

NRMCA CPMB 100	(1990) Concrete Plant Standards
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1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

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SD-03 Product Data

Synthetic Reinforcing Fiber

Concrete Mixture Proportioning.

Concrete mixture proportions shall be determined by the Contractor, in accordance with the requirements in paragraph CONCRETE MIXTURE PROPORTIONING, and submitted for review. The concrete mixture quantities of all ingredients per cubic yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the mass of cement and pozzolan when used, and water; the mass of aggregates in a saturated surface-dry condition; and the quantities of admixtures. **The submission shall be accompanied by test reports from a laboratory complying with Section 01451 CONTRACTOR QUALITY CONTROL and ASTM C 1077 which show that proportions thus selected will produce concrete of the qualities indicated.** No substitution shall be made in the source or type of materials used in the work without additional tests to show that the quality of the new materials and concrete are satisfactory.

Batch Plant

The Contractor shall submit batch plant data to the Contracting Officer for review for conformance with applicable specifications.

Concrete Mixers

The Contractor shall submit concrete mixer data which includes the make, type, and capacity of concrete mixers proposed for mixing concrete.

Placing Equipment and Methods

All placing equipment and methods shall be submitted for review by the Contracting Officer.

SD-06 Test Reports

Aggregate Quality

Aggregate quality tests shall be submitted at least 30 days prior to start of concrete placement, in accordance with paragraph AGGREGATES.

Tests and Inspections

Test results and inspection reports shall be submitted daily and weekly as required in paragraphs REPORTS.

SD-07 Certificates

Testing Technicians; Concrete Construction Inspector.

The Contractor shall submit statements that the concrete testing technicians and the concrete inspectors meet the requirements of

paragraph TESTS AND INSPECTIONS.

Curing and Protection

The curing medium and methods to be used shall be submitted for review and approval for conformance with paragraph CURING AND PROTECTION.

Hot-Weather Placing

If concrete is to be placed under hot-weather conditions, the proposed materials and methods, meeting the requirements of paragraph HOT-WEATHER PLACING and paragraph FINISHING, shall be submitted for review and approval.

Cementitious Materials.

Cementitious materials, including cement and pozzolan, will be accepted on the basis of the manufacturer's certification of compliance.

Impervious-Sheet Curing Materials

Impervious-sheet curing materials shall be certified for compliance with all specification requirements.

Other Chemical Admixtures

Other chemical admixtures shall be certified for compliance with all specification requirements.

Membrane-Forming Curing Compound

Membrane-forming curing compound shall be certified for compliance with all specification requirements.

Epoxy Resin Latex Bonding Compound

Epoxy resin and latex bonding compound shall be certified for compliance with all specification requirements.

Non-Shrink Grout

Descriptive literature of the non-shrink grout proposed for use shall be furnished together with a certificate from the manufacturer stating that it is suitable for the application or exposure for which it is being considered.

1.3 GOVERNMENT TESTING AND SAMPLING

The Government may sample and test aggregates and concrete to determine compliance with the specifications. The Contractor shall provide facilities and labor as may be necessary for procurement of representative test samples. Samples of aggregates will be obtained at the point of

batching in accordance with ASTM D 75. Concrete will be sampled in accordance with ASTM C 172.

1.3.1 Cementitious Materials, Admixtures, and Curing Compound

At least 30 days in advance of concrete placement, the Contractor shall notify the Contracting Officer of the sources for cementitious materials, admixtures, and curing compound, along with sampling location, brand name, type, and quantity to be used in the manufacture and/or curing of the concrete.

1.3.2 Chemical Admixtures Storage

Chemical admixtures that have been in storage at the project site for longer than 6 months or that have been subjected to freezing shall be retested at the expense of the Contractor when directed by the Contracting Officer and shall be rejected if test results are not satisfactory. Chemical admixtures will be accepted based on compliance with the requirements of paragraph CHEMICAL ADMIXTURES.

1.3.3 Concrete Strength

The strength of the concrete will be considered acceptable when the moving average of every 5 sets of compressive strength at 28-day age are above the compressive strength as determined by correlation with 28-day compressive strength tests specified in paragraphs: Mixture Proportioning for 28-day Flexural Strength and Concrete Testing for CQC; and no individual set is more than 500 psi, below the determined compressive strength. Compressive strength test specimens will be made by the Contractor and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. **A beam flexural strength check test, in accordance with ASTM C 192 and ASTM C 78, shall be performed for every 30 cylinder compressive strength test (ASTM C 39).**

a. Investigation of Low-Strength Test Results: When any strength test of standard-cured test cylinders falls below the specified strength requirement by more than 3.5 MPa (500 psi) or if tests of field-cured cylinders indicate deficiencies in protection and curing, steps shall be taken to assure that the load-carrying capacity of the structure is not jeopardized. Non-destructive testing in accordance with ASTM C 597, ASTM C 803, or ASTM C 805 may be permitted by the Contracting Officer to estimate the relative strengths at various locations in the structure as an aid in evaluating concrete strength in place or for selecting areas to be cored. such tests shall not be used as a basis for acceptance or rejection.

b. Testing of Cores: When the strength of concrete in place is considered potentially deficient, cores shall be obtained and tested in accordance with ASTM C 42. At least three (3) representative cores shall be taken from each member or area of concrete in place that is considered potentially deficient. The location of cores will be determined by the Contracting Officer to least impair the performance of the structure. concrete in the

area represented by the core testing will be considered adequate if the average strength of the cores is equal to at least 85 percent of the specified strength requirement and if no single core is less than 75 percent of the specified strength requirement.

c. Load Tests: If the core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be directed by the Contracting Officer in accordance with the requirements of ACI 318M/318RM (ACI 318/318R) Concrete work evaluated by structural analysis or by results of a load test shall be corrected in a manner satisfactory to the Contracting Officer. All investigations, testing, load tests, and correction of deficiencies will be performed and approved by the Contracting Officer at the expense of the Contractor, except that if all concrete is in compliance with the plans and specifications, the cost of investigations, testing, and load tests will be at the expense of the Government.

1.4 DESIGN REQUIREMENTS

1.4.1 Concrete Properties

Specified flexural strength, when specimens are tested in accordance with ASTM C 78 shall be a minimum of 700 psi at 28 days. The maximum allowable water/cement ratio shall be a 0.40 by weight. The total air content shall not exceed 5%. At no time shall the temperature of the concrete be greater than 165 degrees F. The maximum temperature differential between the interior and exterior concrete shall not exceed 36 degrees F.

1.5 CONSTRUCTION TOLERANCES

1.5.1 General

The definitions of the terms used in the following tables shall be as defined in ACI 117/117R. Level and grade tolerance measurement shall be made as soon as possible after finishing. When forms or shoring are used, the measurements shall be made prior to removal. Tolerances are not cumulative. The most restrictive tolerance controls. Tolerances shall not extend the structure beyond legal boundaries. Except as specified otherwise, plus tolerance increases the amount or dimension to which it applies, or raises a level alignment, and minus tolerance decreases the amount or dimension to which it applied, or lowers a level alignment. A tolerance without sign means plus or minus. Where only one signed tolerance is specified, there is no limit in the other direction.

TOLERANCES FOR CORE-LOC STRUCTURAL ELEMENTS

Cross-Sectional Dimensions for Members, such as Columns, Beams, and Slabs.

More than 12 inches but not over 36 inches dimension ... +1/2 inch / -3/8 inch

Over 36 inches dimension +1 inch / -3/4 inch

(2) Structural Sections

TOLERANCES FOR CORE-LOC STRUCTURAL ELEMENTS

(2.1) Vertical Alignment:

Formed surfaces slope with respect to the specified plane.
Vertical alignment of outside corners and joints exposed to
view 1/4 inch in 10 feet

(2.2) Abrupt Variation 1/8 inch

(2.3) Gradual Variation:

Surface finish tolerances as measured by placing a
freestanding (unleveled), 5 foot straightedge
for plane surface curved template for curved
surface anywhere on the surface and allowing it
to rest upon two high spots within 72 hour after
concrete placement. The gap at any point between
the straightedge or template and the surface
shall not exceed. 1/4 inch

1.5.2 Appearance

Permanently exposed surfaces shall be cleaned, if stained or otherwise
discolored, by a method that does not harm the concrete and that is
approved by the Contracting Officer.

1.5.3 Identification

All core-loc units must be readily identifiable by means of a unique
numbering system.

At the time of casting, the unique number shall be inscribed in the top of
one of the flukes of the unit.

**Upon stripping of the form, the unit identification number shall be painted
on each unit in English lettering, block type, minimum 4 inches high and
shall be black enamel finished with protective coating. The paint shall be
safe, permanent, and durable when exposed to the elements; i.e., UV light,
salt water, and other injurious elements.**

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PART 2 PRODUCTS

2.1 MATERIALS

2.1.1 Cementitious Materials

Cementitious materials shall be Portland cement, or Portland cement in
combination with pozzolan and shall conform to appropriate specifications
listed below. Use of cementitious materials in the elements shall be
restricted to one color, one source, and one type.

2.1.1.1 Portland Cement

ASTM C 150, Type II, low alkali.

2.1.1.2 Pozzolan

Pozzolan shall be a fly ash conforming to requirements of ASTM C 618, Class F, with the loss on ignition to 6 percent.

2.1.2 Aggregates

Aggregates shall conform to the requirements of ASTM C 33. Aggregates to be used for production of concrete shall be considered innocuous when tested in accordance with ASTM C 289. Test results, used to validate this property for aggregate sources used, shall be no more than 60 days old at the time of the manufacture of concrete elements.

2.1.3 Chemical Admixtures

Chemical admixtures to be used, when required or permitted, shall conform to the appropriate specification listed.

2.1.3.1 Accelerating Admixture

Accelerators shall meet the requirements of ASTM C 494, Type C or E, except that calcium chloride or admixtures containing calcium chloride shall not be used.

2.1.3.2 Water-Reducing or Retarding Admixture

a. Water-Reducing or Retarding Admixtures: ASTM C 494, Type A, B, or D, except that the 6-month and 1-year compressive strength tests are waived.

b. High-Range Water Reducing Admixture: ASTM C 494, Type F or G except that the 6-month and 1-year strength requirements shall be waived. The admixture may be used only when approved by the Contracting Officer, such approval being contingent upon particular mixture control as described in the Contractor's Quality Control Plan.

2.1.4 Curing Materials

2.1.4.1 Impervious-Sheet Curing Materials

Impervious-sheet curing materials shall conform to ASTM C 171, type optional, except polyethylene film shall not be used. The color of impervious-sheet curing materials will be white opaque.

2.1.4.2 Membrane-Forming Curing Compound

The membrane-forming curing compound shall conform to ASTM C 309, Type 2.

2.1.4.3 Burlap

Burlap used for curing shall conform to COE CRD-C 318.

2.1.5 Water

Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of COE CRD-C 400, and approved by the Contracting Officer.

2.1.6 Non-Shrink Grout

Non-Shrink grout shall conform to ASTM C 1107 and shall be a commercial formulation suitable for the application proposed.

2.1.7 Latex Bonding Compound

Latex bonding compound agents for bonding fresh to hardened concrete shall conform to ASTM C 1059.

2.1.8 Epoxy Resin

Epoxy resins for use in repairs shall conform to ASTM C 881, Type III, Grade I or II.

2.1.9 Fiber Reinforced Concrete

In addition to the requirements specified above, fiber reinforced concrete shall be provided in accordance with ASTM C 1116 Type III, synthetic fiber reinforced concrete, and as follows. Synthetic reinforcing fibers shall be 100 percent virgin polypropylene fibrillated fibers containing no reprocessed olefin materials. Fibers shall have a specific gravity of 0.9, a minimum tensile strength of 70 ksi, graded per manufacturer, and specifically manufactured to an optimum gradation for use as concrete secondary reinforcement. **A minimum of 7.5 pounds of fibers (fortafiber or equal) per cubic yard of concrete shall be used.** Fibers shall be added at the batch plant.

2.2 CONCRETE MIXTURE PROPORTIONING

2.2.1 Quality of Mixture

Mixture proportions shall be selected so that the strength and W/C requirements listed in paragraph DESIGN REQUIREMENTS are met. Concrete shall be composed of cementitious material, water, fine and coarse aggregates, and admixtures. The cementitious material shall be Portland cement or portland cement in combination with pozzolan.

2.2.2 Nominal Maximum-Size Coarse Aggregate

Nominal maximum-size coarse aggregate shall be 1 inch.

2.2.3 Air Content

Air entrainment shall not exceed 5%.

2.2.4 Slump

The slump shall be determined in accordance with ASTM C 143 and shall be within the range of 1 inch to 4 inches.

2.2.5 Concrete Proportioning Studies

Trial design batches, mixture proportioning studies, and testing requirements shall be the responsibility of the Contractor. Mixture proportioning studies shall be performed by a commercial laboratory, inspected by the Government, and approved in writing. The laboratory performing the mixture proportioning shall conform with ASTM C 1077. Strength requirements during mixture proportioning studies shall be based on flexural strength as determined by test specimens fabricated in accordance with ASTM C 192 and tested in accordance with ASTM C 78. Samples of all materials used in mixture proportioning studies shall be representative of those proposed for use on the project and shall be accompanied by the manufacturer's or producer's test reports indicating compliance with these specifications. Trial mixtures having proportion is, slumps, and air content suitable for the work shall be based on methodology described in ACI 211.1, modified as necessary to accommodate flexural strength. Determine the heat of hydration in accordance with ASTM C 186 for each trial batch.

2.2.5.1 Water-Cement Ratio

At least three (3) different water-cement ratios, which will produce a range of strength encompassing that required on the project, shall be used.

The maximum allowable water-cement ratio required in paragraph 1.4.1, Concrete Properties will be the equivalent water-cement ratio as determined by conversion from the mass ratio of water to cement plus pozzolan by the weight equivalent method as described in ACI 211.1. If pozzolan is used in the concrete mixture, the minimum pozzolan content shall be 15 percent by mass of the total cementitious material, and the maximum shall be 35 percent.

Laboratory trial mixtures shall be proportioned for maximum permitted slump and air content.

2.2.5.2 Trial Mixtures Studies

Separate sets of trial mixture studies shall be made for each combination of cementitious materials and each combination of admixtures proposed for use. No combination of either shall be used until proven by such studies, except that, if approved in writing and otherwise permitted by these specifications, an accelerator or a retarder may be used without separate trial mixture study. Separate trial mixture studies shall also be made for concrete for any placing method proposed which requires special properties.

The temperature of concrete in each trial batch shall be reported. Each mixture shall be designed to promote easy and suitable concrete placement,

consolidation and finishing, and to prevent segregation and excessive bleeding. Concrete proportioning studies shall be performed using the following procedures:

2.2.5.3 Mixture Proportioning for 28-Day Flexural Strength

The following step by step procedure shall be followed:

- a. Fabricate all beams and cylinders for each mixture from the same batch or blend of batches. fabricate and cure all beams and cylinders in accordance with ASTM C 192, using 6 inch x 6 inch beams and 6 inch x 12 inch cylinders.
- b. Test beams in accordance with ASTM C 78, cylinders in accordance with ASTM C 39.
- c. Fabricate and cure test beams from each mixture for 7-, 14-, and 28-day flexural tests; six (6) beams to be tested per age.
- d. Fabricate and cure test cylinders from each mixture for 7-, 14-, and 28-day compressive strength tests; six (6) cylinders to be tested per age.
- e. Using the average strength for each w/c at each age, plot all results from each of the three (3) mixtures on separate graphs for w/c versus:
 - 7-day flexural strength,
 - 14-day flexural strength,
 - 28-day flexural strength,
 - 7-day compressive strength,
 - 14-day compressive strength,
 - 28-day compressive strength.
- f. From these graphs select a w/c that will produce a mixture giving a 28-day flexural strength equal to the required strength determined in accordance with paragraph "CONCRETE PROPERITES".
- g. Using the above selected w/c, select from the graphs the expected 7-, 14-, and 28-day flexural strengths and the expected 7-, 14-, and 28-day compressive strengths for the mixture.
- h. From the above expected strengths for the selected mixture the following Correlation Ratios:
 - (1) Ratio of the 28-day compressive strength of the selected mixture to the 28-day flexural strength of the mixture (for acceptance).
 - (2) Ratio of the 7-day compressive strength of the selected mixture to the 28-day flexural strength of the mixture (for CQC control).
- i. If there is a change in materials, additional mixture design

studies shall be made using the new materials and new Correlation Ratios shall be determined.

j. No concrete shall be placed until the Contracting Officer has approved the Contractor's mixture proportions.

2.2.6 Average Flexural Strength Required for Mixtures

In order to ensure meeting, during production, the strength requirements specified in paragraph "CONCRETE PROPERTIES", the mixture proportions selected during mixture proportioning studies and used during construction shall produce a required average flexural strength exceeding the specified strength, R, by the amount indicated below. This required average flexural strength, Ra, will not be a required acceptance criteria during concrete production, but will be used for CQC operations as specified in paragraph TESTS AND INSPECTION. During production, the required Ra shall be adjusted (increased or decreased), as appropriate and as approved, based on the standard deviation of equivalent 28-day strengths being attained during placement.

2.2.6.1 From Previous Test Records

Where a concrete production facility has previous test records, a standard deviation shall be established in accordance with the applicable provisions of ACI 214.3R. Test records from which a standard deviation is calculated shall represent materials, quality control procedures, and conditions similar to those expected, shall represent concrete produced to meet a specified flexural strength or strengths within 70 psi of the 28-day flexural strength specified for the proposed work, and shall consist of at least 30 consecutive tests. A strength test shall be the average of the strengths of two (2) specimens made from the same sample of concrete and tested at 28-days. Required average flexural strength, Ra, used as the basis for selection of concrete proportions shall be the value from the equation that follows, using the standard deviation as determined above:

$$R_a = R + 1.34S$$

Where: S = Standard Deviation
 R = Specified Flexural Strength
 Ra = Required Average Flexural Strength

Where a concrete production facility does not have test records meeting the requirements above but does have a record based on 15 to 29 consecutive tests, a standard deviation shall be established as the product of the calculated standard deviation and a modification factor from the following table:

<u>Number of Tests</u>	<u>Modification Factor for Standard Deviation</u>
15	1.16
20	1.08
25	1.03
30 or more	1.00

2.2.6.2 Without Previous Test Records

When a concrete production facility does not have sufficient field strength test records for calculation of the standard deviation, the required average strength, R_a , shall be determined by adding 15 percent to the specified flexural strength, R .

PART 3 EXECUTION

3.1 EQUIPMENT

3.1.1 On Site Batch Plant

Any batching plant located on the island of Lanai shall conform to the requirements of NRMCA CPMB 100 and as specified; however, rating plates attached to batch plant equipment are not required. The batching controls shall be semiautomatic, or automatic. The semiautomatic batching system shall be provided with interlocks such that the discharge device cannot be actuated until the indicated material is within the applicable tolerance. The batching system shall be equipped with an accurate recorder or recorders that meet the requirements of NRMCA CPMB 100.

3.1.1.1 Scales

The equipment for batching by mass shall conform to the applicable requirements of NIST HB 44, except that the accuracy shall be plus or minus 0.2 percent of scale capacity. The Contractor shall provide standard test weights and any other auxiliary equipment required for checking the operating performance of each scale or other measuring devices. Tests shall be made in the presence of a Government inspector.

3.1.1.2 Batching Tolerances

a. Weighing Tolerances:

<u>Required Material</u>	<u>Percent of Mass</u>
Cementitious Materials	0 to plus 2
Aggregate	plus or minus 2
Water	plus or minus 1
Chemical Admixture	0 to plus 6

b. Volumetric Tolerances: For volumetric batching equipment, the following tolerances shall apply to the required volume of material being batched:

<u>Required Material</u>	<u>Percent of Mass</u>
Water	Plus or minus 1 percent
Chemical Admixtures	0 to plus 6 percent

3.1.1.3 Moisture Control

The plant shall be capable of ready adjustment to compensate for the varying moisture content of the aggregates and to change the masses of the materials being batched.

3.1.2 Concrete Mixing

Concrete will be mixed in accordance with the requirements of ASTM C 94.

3.1.3 Vibrators

Vibrators of the proper size, frequency, and amplitude shall be used for the type of work being performed in conformance with the following requirements:

Application (inches)	Head Diameter (inches)	Frequency VPM	Amplitude
General Constr.	2 to 3.5	8,000 to 12,000	0.025 to 0.05

The frequency and amplitude shall be determined in accordance with COE CRD-C 521.

3.2 PREPARATION FOR PLACING

Before placement of concrete, care shall be taken to insure that forms are properly aligned and in a condition to receive concrete. They will be cleaned to the satisfaction of the Contracting Officer's Representative. Any needed repairs will be completed and approved prior to delivery of concrete to the forms. All stabilizers, braces, clamps, and other necessary fixtures will be in place and properly fastened prior to the delivery of concrete. The Contractor will have sufficient manpower, vibrators, and materials for curing the concrete on site ready for use prior to delivery of concrete to the forms. Placement will be terminated at the direction of the COR at anytime in which the COR determines that unsatisfactory elements may be manufactured.

3.3 PLACING

3.3.1 Preproduction Trial Core-Loc Units

Prior to full scale production of core-locs units, the Contractor shall cast three (3) preproduction units. **The trial units shall be full scale. The trial units shall be cast in accordance with these specifications and the approved submittals, Section 01330 SUBMITTALS. The trial units shall be cast in the presence of the CLS and the COR. The trial core-loc units shall be tested in accordance with this Section.** In addition, the Contractor shall install four (4) thermocouples in each trial unit. A thermocouple shall be located at the intersection of the axis of each H member and the cross member. A thermocouple shall also be located at the center of each H member, 3 inches from the top of the member. The thermocouples shall be attached to a data logger. Temperature readings shall be recorded from each thermocouple daily for 28 days. The Contractor

shall submit a report containing the daily temperature readings for the first seven (7) days. The report shall be submitted within ten (10) days of casting the unit. Production unit casting shall not commence until the 28-day data has been submitted and approved by the Contracting Officer.

3.3.2 General

Core-loc elements shall be cast with the vertical H-members upright. See the Core-loc casting details in the project plans.

3.3.3 Placing Procedures

Surfaces may be dampened immediately before placement if necessary. Concrete placement will not be permitted when, in the opinion of the Contracting Officer, weather conditions prevent proper placement and consolidation. Concrete shall be deposited as close as possible to its final position in the forms and, in so depositing, there shall be no vertical drop greater than 5 feet except where suitable equipment is provided to prevent segregation and where specifically authorized. Depositing of the concrete shall be so regulated that it may be effectively consolidated in horizontal layers 2.0 feet or less in thickness with a minimum of lateral movement. The amount deposited in each location shall be that which can be readily and thoroughly consolidated. Sufficient placing capacity shall be provided so that concrete placement can be kept plastic and free of cold joints while concrete is being placed. Concrete shall be placed by methods that will prevent segregation or loss of ingredients. Any concrete transferred from one conveying device to another shall be passed through a hopper that is conical in shape. The concrete shall not be dropped vertically more than 5 feet except where a properly designed and sized elephant trunk with rigid drop chute bottom section is provided to prevent segregation and where specifically authorized. In no case will concrete be discharged to free-fall through reinforcing bars.

3.3.4 Time Interval Between Mixing and Placing

Concrete shall be placed within 30 minutes after discharge into non-agitating equipment. When concrete is truck-mixed or when a truck mixer or agitator is used for transporting concrete mixed by a concrete plant mixer, the concrete, shall be delivered to the site of the work, and discharge shall be completed within 1-1/2 hours after introduction of the cement to the aggregates. When the length of haul makes it impossible to deliver truck-mixed concrete within these time limits, batching of cement and a portion of the mixing water shall be delaying until the truck mixer is at or near the construction site.

3.3.5 Hot-Weather Placing

Concrete shall be properly placed and finished with procedures previously submitted in accordance with paragraph SUBMITTALS. **The concrete-placing temperature shall not exceed 85 degrees F when measured in accordance with ASTM C 1064.** Cooling of the mixing water and aggregates, or both, may be required to obtain an adequate placing temperature. A retarder meeting the requirements of paragraph WATER-REDUCING OR RETARDING ADMIXTURES may be used to facilitate placing and finishing. Steel forms and reinforcement

shall be cooled prior to concrete replacement when steel temperatures are greater than 120 degrees F. Conveying and placing equipment shall be cooled if necessary to maintain proper concrete-placing temperature.

3.3.6 Consolidation

Immediately after placement, each layer of concrete, shall be consolidated by internal vibrating equipment. Vibrators shall not be used to transport concrete within the forms. Hand spading may be required, if necessary, with internal vibrating along formed surfaces permanently exposed to view. Form or surface vibrators shall not be used unless specifically approved. The vibrator shall be inserted vertically at uniform spacing over the entire area of placement. The distance between insertions shall be approximately 1-1/2 times the radius of action of the vibrator. The vibrator shall penetrate rapidly to the bottom of the layer and at least 6 inches into the preceding unhardened layer if such exists. It shall be held stationary until the concrete is consolidated and then withdrawn slowly.

3.4 FINISHING

The ambient temperature of spaces adjacent to surfaces being finished shall be not less than 40 degrees F. In hot weather when the rate of evaporation of surface moisture, as determined by use of Figure 2.1.5 of ACI 305R, may reasonably be expected to exceed 0.2 pounds per square foot per hour. Provisions for windbreaks, shading, fog spraying, or wet covering with a light-colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as finishing operations will allow. All unformed surfaces shall have a trowel finish. Finishing shall be as specified below. Joints shall be carefully made with a jointing or edging tool. The finished surfaces shall be protected from stains or abrasions. Grate tampers or jitterbugs shall not be used.

3.4.1 Unformed Surfaces

A trowel finish shall be applied to all unformed surfaces. Concrete surfaces shall be finished with a float finish, and after surface moisture has disappeared, the surface shall be troweled to a smooth, even, dense finish free from blemishes including trowel marks.

3.4.2 Formed Surfaces

Unless another finish is specified, surfaces shall be left with the texture imparted by the forms except that defective surfaces shall be repaired as described in paragraph FORMED SURFACE REPAIR. Uniform color of the concrete shall be maintained by use of only one mixture without changes in materials or proportions for any structural element. The form panels used to produce the finish shall be orderly in arrangement, with joints between panels planned in approved relation to openings, building corners, and other architectural features. Forms shall not be reused if there is any evidence of surface wear or defects that would impair the quality of the surface.

3.4.3 Formed Surface Repair

After removal of forms, all ridges, lips, and bulges on surfaces permanently exposed shall be removed. All repairs shall be completed within 48 hours after form removal. Surfaces shall have surface defects repaired as follows: defective areas, voids, and honeycombs smaller than 16 square inches in area and less than 1/2 inch deep and bug holes exceeding 1/2 inch in diameter shall be chipped and filled with dry-packed mortar. Core-loc units having defective areas larger than described shall be rejected.

The Contractor shall keep a record of all repair operations. All repaired units must be inspected and approved by the COR, who reserves the right to reject units repaired by this method if he deems them unsatisfactory.

3.4.4 Material and Procedure for Repairs

The cement used in the dry-packed mortar or replacement concrete shall be a blend of the cement used for production of project concrete and white Portland cement properly proportioned so that the final color of the mortar or concrete will match adjacent concrete. Trial batches shall be used to determine the proportions required to match colors. Dry-packed mortar shall consist of one part cement to two and one-half parts fine aggregate. The fine aggregate shall be that used for production of project concrete. The mortar shall be remixed over a period of at least 30 minutes without addition of water until it obtains the stiffest consistency that will permit placing. Mortar shall be thoroughly compacted into the prepared void by tamping, rodding, ramming, etc. and struck off to match adjacent concrete. Metal tools shall not be used to finish permanently exposed surfaces. The repaired areas shall be cured for seven (7) days. The temperature of the in situ concrete, adjacent air, and replacement mortar shall be above 40 degrees F during placement, finishing, and curing. Other methods and materials for repair maybe used only when approved in writing by the Contracting Officer. Repairs of the so called "plaster-type" will not be permitted.

3.5 CURING AND PROTECTION

3.5.1 Duration

The length of the curing period shall be determined by the type of cementitious material, as specified below. Concrete shall be cured by an approved method.

Portland cement blended with 25 percent or less fly-ash	14 days
Portland cement blended with more than 25 percent fly-ash	25 days

Immediately after placement, concrete shall be protected from premature drying, extremes in temperatures, rapid temperature change, and mechanical damage. All materials and equipment needed for adequate curing and protection shall be available and at the placement site prior to the start of concrete placement. Concrete shall be protected from the damaging effects of rain for 12 hours and from flowing water for 14 days. No fire or excessive heat including welding shall be permitted near or in direct

contact with concrete at any time.

3.5.2 Moist Curing

Moist cured concrete shall be maintained continuously, not periodically, wet for the entire curing period. If water or curing materials stain or discolor concrete surfaces that are to be permanently exposed, they shall be cleaned as required in paragraph APPEARANCE. Where wooden form sheathing is left in place during curing, the forms shall be kept wet at all times. Where steel forms are left in place during curing, the forms shall be carefully broken loose from the hardened concrete and curing water continuously applied into the void so as to continuously saturate the entire concrete surface. Horizontal surfaces may be moist cured by ponding, by covering with a minimum uniform thickness of 2 inches of continuously saturated sand, or by covering with saturated non-staining burlap or cotton mats. Horizontal construction joints may be allowed to dry for 12 hours immediately prior to the placing of the following lift.

3.5.3 Membrane-Forming Curing Compound

Concrete may be cured with an approved membrane-forming curing compound in lieu of moist curing. The curing compound shall be applied to formed surfaces immediately after the forms are removed and prior to any patching or other surface treatment except the cleaning of loose sand, mortar, and debris from the surface. The surfaces shall be thoroughly moistened with water, and the curing compound applied as soon as free water has disappeared and bleeding has stopped. The curing compound shall be applied in a two-coat continuous operation by approved motorized power-spraying equipment operating at a minimum pressure of 75 psi, at a uniform coverage of not more than 400 square feet per gallon for each and the second coat shall be applied perpendicular to the first coat. Concrete surfaces that have been subjected to rainfall within 3 hours curing compound has been applied shall be resprayed by the method and coverage specified. All concrete surfaces on which the curing compound has been applied shall be adequately protected for the duration of the entire curing period from pedestrian and vehicular traffic and from any other cause that will disrupt the continuity of the curing membrane.

3.6 TESTS AND INSPECTIONS

Tests and inspections shall conform to the following requirements.

3.6.1 General

The Contractor shall perform the inspections and tests described below, and based upon the results of these inspections and tests, he shall take the action required and submit reports as required. When, in the opinion of the Contracting Officer, the concreting operation is out of requirements of ASTM C 1077. The individuals who sample and test concrete or the constituents of concrete as required in this specification shall have demonstrated a knowledge and ability to perform the necessary test procedures equivalent to the ACI minimum guidelines for certification of Concrete Field Testing Techniques, Grade I. The individuals who perform the inspection of concrete construction shall have demonstrated a knowledge

and ability equivalent to the ACI minimum guidelines for certification of Concrete Construction Inspector, Level II. **The Government will inspect the laboratory, equipment, and test procedures prior to start of concreting operations and at least once per year thereafter for conformance with ASTM C 1077 and Section 01451 CONTRACTOR QUALITY CONTROL.**

3.6.2 Testing and Inspection Requirements

3.6.2.1 Aggregates

Aggregates for concrete production will be tested by the Contractor to insure conformance to the requirements of ASTM C 33. Aggregates shall be non-alkali silica reactive. Gradation tests, as a minimum will be performed on the first day of concrete production and at least once every other day while production continues. At any point in the placement when the Contracting Officer's Representative determines that the concrete's properties may be affected by the aggregate gradations additional tests will be performed, without cost to the Government, as directed.

3.6.2.2 Scales

The accuracy of the scales have been certified by the state or other public agency responsible for weights and measures within a period of one year prior to the start of concrete.

3.6.2.3 Batch-Plant Control

The measurement of all constituent materials including cementitious materials, each size of aggregate, water, and admixtures shall be continuously controlled. The aggregate weights and amount of added water shall be adjusted as necessary to compensate for free moisture in the aggregates. A report shall be prepared indicating type and source of cement used, type and source of pozzolan used, amount and source of admixtures used, aggregate source, the required aggregate and water weights per cubic yard, amount of water as free moisture in each size of aggregate, and the batch aggregate and water weights per cubic yard for each class of concrete batched during plant operation.

3.6.2.4 Concrete Mixture

a. Slump Testing: In addition to slump tests which shall be made when test specimens are fabricated, at least one slump test shall be made on randomly selected batches in accordance with ASTM C 143 for each separate concrete mixture produced during each period of concrete production each day. Also, additional tests shall be made when excessive variation in workability is reported by the placing foreman or Government's quality assurance representative. Test results shall be plotted on control charts which shall at all times be readily available to the Government. Copies of the current control charts shall be kept in the field by the Contractor's quality control representatives and results plotted as tests are made.

b. Temperature: The temperature of the concrete shall be

measured when compressive strength specimens, as described in Section 03300, paragraph 3.6.2.4 are fabricated. Measurement shall be in accordance with ASTM C 1064. The temperature shall be reported along with the compressive strength data. The Contractor shall also record the air, aggregate, fresh concrete and mixing water temperature. Any significant difference, in the opinion of the COR, between these recorded temperatures and the temperatures recorded during the casting of the Trial Units, shall be cause to measure the interior and exterior concrete temperature of the core-loc units using thermocouples as described in Section 03310, paragraph 3.3.1.

c. Compressive-Strength Specimens: At least one set of test specimens shall be made each day on each different concrete mixture placed during the day. Additionally, the strength tests shall represent no more than 100 cubic yards of concrete. Additional sets of test cylinders shall be made, as directed by the Contracting Officer, when the mixture proportions are changed or when low strengths have been detected. A random sampling plan shall be developed by the Contractor and approved by the Contracting Officer prior to the start of construction. The plan shall assure that sampling is done in a completely random and unbiased manner. A set of test specimens for concrete with a 28-day specified per paragraph DESIGN REQUIREMENTS shall consist of five (5) cylinders, two (2) to be tested at 7 days and two (2) at 28 days and one (1) held in reserve. Test specimens shall be molded and cured in accordance with ASTM C 31 and tested in accordance with ASTM C 39. All compressive-strength test results shall be reported immediately to the Contracting Officer. Quality control charts shall be kept for individual strength tests, moving average for strength, and moving average for range for each mixture used. The charts shall be similar to those found in ACI 214.

3.6.2.5 Inspection Before Placing

Foundation or construction joints and forms shall be inspected for quality by the Contractor in sufficient time prior to each concrete placement to certify to the Contracting Officer that they are ready to receive concrete. The results of each inspection shall be reported in writing.

3.6.2.6 Placing

a. Placing Inspection: The placing foreman shall supervise all placing operations, shall determine that the correct quality of concrete or grout is placed in each location as directed and shall be responsible for measuring and recording concrete temperatures and ambient temperature hourly during placing operations, weather conditions, time of placement, yardage placed, and method of placement.

b. Placing Corrective Action: The placing foreman shall not permit batching and placing to begin until he has verified that an adequate number of vibrators in working order and with competent

operators are available. Placing shall not be continued if any pile of concrete is inadequately consolidated. If any batch of concrete fails to meet the temperature requirements, immediate steps shall be taken to improve temperature controls.

3.6.2.7 Vibrators

a. **Vibrator Testing and Use:** The frequency and amplitude of each vibrator shall be determined in accordance with COE CRD-C 521 prior to initial use and additional tests shall be made as directed when a vibrator does not appear to be adequately consolidating the concrete. The frequency shall be determined at the same time the vibrator is operating in concrete with the tachometer held against the upper end of the vibrator head while almost submerged and just before the vibrator is withdrawn from the concrete. The amplitude shall be determined with the head vibrating in air. Two (2) measurements shall be taken, one (1) near the tip and another near the upper end of the vibrator head and these results averaged. The make, model, type, and size of the vibrator and frequency and amplitude results shall be reported in writing.

b. **Vibrator Corrective Action:** Any vibrator not meeting the requirements of paragraph VIBRATORS shall be immediately removed from service and repaired or replaced.

3.6.2.8 Curing

a. **Moist-Curing Inspections:** At least once each shift, and once per day on non-work days an inspection shall be made of all areas subject to moist curing. The surface moisture condition shall be noted and recorded.

b. **Moist-Curing Corrective Action:** When a daily inspection report lists an area of inadequate curing, immediate corrective action shall be taken, and the required curing period for such areas shall be extended by one (1) day.

c. **Membrane-Curing Inspection:** No curing compound shall be applied until the Contractor's authorized representative has verified that the compound is properly mixed and ready for spraying at the end of each operation, he shall estimate the quantity of compound used by measurement of the container and the area of concrete surface covered and compute the rate of coverage in square feet per gallon. He shall note whether or not coverage is uniform.

d. **Membrane-Curing Corrective Action:** When the coverage rate of the curing compound is less than that specified or when the coverage is not uniform, the entire surface shall be sprayed again.

e. **Sheet-Curing Inspection:** At least once each shift and once per day on non-work days, an inspection shall be made of all areas being cured using material sheets. The condition of the covering

and the tightness of the laps and tapes shall be noted and recorded.

f. Sheet-Curing Corrective Action: When a daily inspection report lists any tears, holes, or laps or joints that are not completely closed, the tears and holes shall promptly be repaired or the sheets replaced, the joints closed, and the required curing period for those areas shall be extended by one (1) day.

3.6.3 Reports

All results of tests or inspections conducted shall be reported informally as they are completed and in writing daily. A weekly report shall be prepared for the updating of control charts covering the entire period from the start of the construction season through the current week. These requirements do not relieve the Contractor of the obligation to report certain failures immediately as required in preceding paragraphs. Such reports of failures and the action taken shall be confirmed in writing in the routine reports. The Contracting Officer has the right to examine all test and inspection records.

3.7 PROTECTION OF ELEMENTS

Great care shall be exercised in the operation of construction equipment adjacent to the core-loc elements.

-- End of Section --