

SPECIFICATIONS FOR
25 METER FULLY CONTAINED SDZ RANGE
KEAUKAHA MILITARY RESERVATION, HILO, HAWAII
STATE OF HAWAII, DEPARTMENT OF DEFENSE
HAWAII ARMY NATIONAL GUARD
CA-1410

ISSUED BY:
STATE OF HAWAII
DEPARTMENT OF DEFENSE
3949 DIAMOND HEAD ROAD,
HONOLULU, HAWAII 96816-4495
TELEPHONE: 808-733-4250

APRIL 2014

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

000101 PROJECT TITLE PAGE
000107 SEALS PAGE

DIVISION 01 - GENERAL REQUIREMENTS

012900 PAYMENT PROCEDURES
013100 PROJECT MANAGEMENT AND COORDINATION
013200 CONSTRUCTION PROGRESS DOCUMENTATION
013233 PHOTOGRAPHIC DOCUMENTATION
013300 SUBMITTAL PROCEDURES
013529 SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS
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015000 TEMPORARY FACILITIES AND CONTROLS
015720 ENVIRONMENTAL PROTECTION MEASURES/BEST MANAGEMENT
PRACTICES
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DIVISION 02 - EXISTING CONDITIONS

024116 STRUCTURE DEMOLITION

DIVISION 03 - CONCRETE

033000 CAST-IN-PLACE CONCRETE

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051200 STRUCTURAL STEEL FRAMING
055000 METAL FABRICATIONS

DIVISION 06 - WOOD (NOT REQUIRED)**DIVISION 07 - THERMAL AND MOISTURE PROTECTION (NOT REQUIRED)****DIVISION 08 - OPENINGS (NOT REQUIRED)****DIVISION 09 - FINISHES**

099113 EXTERIOR PAINTING

DIVISION 10 - SPECIALTIES

101400 SIGNAGE

DIVISION 11 - EQUIPMENT

114860 SHOOTING RANGE PROJECTILE CONTAINMENT PRODUCTS

DIVISION 12 - FURNISHINGS (NOT REQUIRED)

DIVISION 13 - SPECIAL CONSTRUCTION (NOT REQUIRED)

DIVISION 14 - CONVEYING EQUIPMENT (NOT REQUIRED)

DIVISION 21 - FIRE SUPPRESSION (NOT REQUIRED)

DIVISION 22 - PLUMBING (NOT REQUIRED)

DIVISION 23 - HEATING VENTILATING AND AIR CONDITIONING (NOT REQUIRED)

DIVISION 26 - ELECTRICAL (NOT REQUIRED)

DIVISION 27 - COMMUNICATIONS (NOT REQUIRED)

DIVISION 28 - ELECTRONIC SAFETY AND SECURITY (NOT REQUIRED)

DIVISION 31 - EARTHWORK

311000 SITE CLEARING
311001 PROJECT SOILS REPORT AND LOGS
312000 EARTH MOVING
312319 DEWATERING

DIVISION 32 - EXTERIOR IMPROVEMENTS

329200 TURF AND GRASSES
323113 CHAIN LINK FENCES AND GATES

DIVISION 33 - UTILITIES

334100 STORM UTILITY DRAINAGE PIPING

APPENDIX 1

PROJECT SOILS REPORT AND LOGS

DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL VOLUME 1 Review Set - Not for Construction

- A. 25M Baffled Zero Range.
- B. Hawaii Army National Guard (HIARNG).
- C. Kapolei, HI.
- D. Owner Project No. 15120001.
- E. Engineer's Project No. 2552223000.
- F. Leidos Engineering, LLC.
- G. One West 3rd Street, Suite 200.
- H. Tulsa, OK 74103.
- I. Phone: 918-492-1600.
- J. Fax: 918-492-1031.
- K. Issued: 5/10/2013.

END OF DOCUMENT 000101

25-Meter Fully Contained SDZ Range
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Hawaii Army National Guard (HIARNG)

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DOCUMENT 000107 - SEALS PAGE

1.1 DESIGN PROFESSIONALS OF RECORD

A. Architect: Not Applicable

B. Civil Engineer:

1. Dayne Weierbach.



THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION;
CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION

Dayne Weierbach 4.30.2016
Signature Expiration Date of the License

C. Landscape Architect: Not Applicable

D. Structural Engineer:

1. John Westerheide.

E. Fire-Protection Engineer: Not Applicable

F. Plumbing Engineer: Not Applicable

G. HVAC Engineer: Not Applicable

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H. Electrical Engineer: Not Applicable

END OF DOCUMENT 000107

DOCUMENT 003143 - PERMIT APPLICATIONS

1.1 PERMIT APPLICATION INFORMATION

- A. These Documents with their referenced attachments are part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of the Bidders' own investigations. These Document and their attachments are not part of the Contract Documents.
- B. Building Permit Application: Building Permit Application A2014-BH00078 has been filed with and approved by the County of Hawaii Department of Public Works - Building Division. Contractor shall complete the Building Permit Application by affixing the Contractor's License Number and Responsible Managing Employee's (RME) signature to the approved application and remitting the Building Permit Fee of \$9,202.00 to the County of Hawaii Department of Public Works - Building Division - Aupuni Center, 101 Pauahi Street, Suite 7, Hilo HI 96720 within five days of the Notice to Proceed.
- C. A NPDES Notice of Intent (NOI) for the Project has been prepared and submitted through the Hawaii Department of Health, Clean Water Branch (CWB), and the filing fee has been paid by the State of Hawaii, Department of Defense. The approved NPDES NOI for the Project will be made available to the Contractor during the Pre-Construction Conference.
- D. A Stormwater Pollution Prevention Plan (SWPPP) has been prepared by the Engineer as part of the NPDES NOI process to accompany the Erosion and Sediment Control drawings in the Contract Documents. The SWPPP has not been submitted to the Hawaii Department of Health, Clean Water Branch (CWB), but is available should the CWB request the SWPPP documentation. The SWPPP prepared by the Engineer will be made available at the Contractor's request, or the Contractor may prepare their own SWPPP that corresponds to how they intend to construct the Project and provide stormwater pollution prevention.
- E. HRS 103-50 Document Transmittal Form has been submitted for this Project through the Hawaii Department of Health, Disability and Communication Access Board (DCAB) along with the Contract Drawings and required Review Fee for compliance with HRS 103-50. This Project is a National Guard facility designed and constructed primarily for use by able-bodied military personnel and accessibility is not required in accordance with paragraph 4.1.4(2) Military Exclusions extracted from the United States Access Board website that represents the Uniform Federal Accessibility Standards (UFAS), and the Architectural Barriers Act, 42 U.S.C 4151-4157.

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

END OF DOCUMENT 003143

COUNTY OF HAWAII DEPARTMENT OF PUBLIC WORKS – BUILDING DIVISION
BUILDING PERMIT WORKSHEET FOR CHAPTER 5, PERTAINING TO BUILDING

NOTE: THIS WORKSHEET SHALL ACCOMPANY CONSTRUCTION DRAWINGS. APPLICANT IS RESPONSIBLE TO APPLY IN PERSON.
WE DO NOT ACCEPT WORKSHEET / PLANS ELECTRONICALLY OR BY MAIL

Section 5-22. Expiration. (a) Every permit issued by the building official under the provisions of this code shall expire by limitation and become null and void (i) three (3) years after the date of issuance, or (ii) 180 days from the date of issuance if the building or work authorized by the permit is not commenced by such date. A permit shall expire if the building or work authorized by the permit is suspended or abandoned for a period of 180 days or more at any time after the work has commenced. In the event of strikes or other causes beyond the control of the builder, the building official may extend the aforementioned three (3) year or 180-day periods. The extension of time granted shall be a reasonable length of time but in no case exceed six (6) months. Requests for an extension must be made in writing to the building official. No exceptions will be allowed for building permits issued prior to the adoption of this code. (b) Upon expiration of a permit, all work shall cease and shall not be recommenced until a new permit is obtained. The building official may waive the requirements for submittal of plans and specifications in connection with a permit renewal if the work previously permitted remains the same, no amendments have been made to the building code affecting the work, and previously approved plans are still on file. When the building official determines that plans need not be submitted, the original plans, stamped and approved by the building official, shall be the renewed permit plans. (c) An owner-builder permit shall expire by limitation and become null and void five (5) years after the date of issuance. If the building or work authorized by the permit is suspended or abandoned any time after the work has commenced, the building official, upon request, may suspend the permit expiration until such a time that the owner-builder is ready to re-commence building or work authorized by approved permit. (Section 5-22) 3) refunds for permits shall be made in accordance with section 2-12 of the Hawai'i county code. (Section 5-32); 4) separate permits are required for electrical, plumbing, gas, signs, driveways, and grading; 5) data provided herein is public information.

This must be completed before processing by building division commences
APPLICANT TO FILL IN AREA BELOW - PLEASE PRINT WITH BLACK BALLPOINT OR TYPE

Legal Owner: State of Hawai'i Mailing Address: Kapolei, HI
Lessee, Tenant: National Guard Hawai'i, FMO Mailing Address: 3949 Diamond Head Rd, Honolulu, HI 96816

Plans by: Leidos Engineering, LLC Qualification: AR SE ME CE OTHER _____

Builder: Out- to- Bid Mailing Address: Out- to -Bid

Scope of Work: New Alteration Move Reconstruction Electrical
 Addition Package Home Repair Demolition Emergency Plumbing

For New Residential Applications: Is this dwelling located in a wind borne debris region?
 Yes. Protection provided by: Protective glazing Plywood or shutters Residential safe room
 No.

Description of Work: Construct new Baffled 10/25 Meter Rifle and Machine Zero Range. Work also includes demolition of a portion of the existing baffle structures, and site grading and drainage and site preparation to accommodate the baffled range.

Estimated Valuation For All Work To Be Performed: \$ 2,999,000.00 Project Address: Keaukaha Military Reservation, Hilo, HI

Flood Zone: _____ Engineering (initial): _____ Date: _____

DECLARATION (SEC 444 - HRS) CHECK (X) ONE

CONTRACTOR DECLARATION

I declare that I am licensed under the provisions of Chapter 444, HRS, of the Department of Commerce & Consumer Affairs, State of Hawai'i. My license no. Out -to-Bid is in full force and in effect. **NOTE: RME (Responsible Managing Employee) only to sign. Notarized authorization from RME required for designated agents.**

OWNER-BUILDER DECLARATION

I declare an exemption under Sec. 444-2(7) for the following reasons: 1) this exemption allows me, as the owner or lessee of the property, to act as my own general contractor without possessing a license; 2) to supervise the construction myself; 3) to hire licensed subcontractors; 4) the building is for my personal use and not for the use or occupancy by the general public; 5) building will not be built for sale or lease within one (1) year after construction is complete. Section 5-4 Definition "Owner-builder" means owners or lessees of property who build or improve structures on their property for their own use, or for use by their immediate family. This definition shall not preempt owner-builder by exemption as defined by section 444-2.5, Hawai'i Revised Statues.

OWNER'S PHONE NO. 808-672-1543

EMAIL: morris.m.onishi.nfg@mail.mil

CONTRACTOR'S PHONE NO. Out To Bid

EMAIL: Out To Bid

TAX MAP KEY NUMBER				
Z	S	PL	PAR	LOT
(3) 2	1	13	10	

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County of Hawai'i, Department of Public Works Building Division Residential Building Permit Checklist

The purpose is to provide a checklist and assist permit applicants with the minimum information required for the County of Hawai'i single-family/two-family detached residential building permit applications. If the minimum information indicated below is not provided, the plan review may not be completed in a timely manner and/or denied plan submittal. Please use this as a guide and attach it with the building plans. Plans shall be of sufficient clarity. Indicating the extent of the proposed work and showing in detail, it conforms to the provisions of all relevant laws and ordinances.

SUBMITTAL REQUIREMENTS: MUST BE DRAWN TO SCALE AND NOTE THE PAGE DIMENSIONED. CHECK EACH BOX.

- A completed Building Permit Worksheet is required with the plans.
- Two complete sets of plans. One original size and one photocopy, drawn to scale in ink with dimensions preferably on an 11" x 17" paper size. Blue prints are acceptable..
- Indicate the nature and extent of the proposed work clearly distinguished from existing work.
- Each plan sheet shall include the authorized seal or stamp and signature of a professional engineer or, architect licensed in the State of Hawai'i and include this Statement. "This work was prepared by me or under my supervision and construction of this project will be under my observation." When a professional seal or stamp and signature is required, refer to the Residential Building Permit Guidelines.
- Planning, Engineering, Solid Waste, and the State of Hawai'i Department of Health plan review criteria can be found in the Residential Building Permit Guidelines.
- TITLE OR FIRST SHEET: Provide the project information including the legal property owner, lessee/tenant, tax map key (TMK), site address and site location map.
- PLOT/SITE PLAN:
 - Show the entire TMK parcel, property line measurements, easements, abutting streets and north arrow. Detailed plot/site plan shall be drawn to and indicated by scale. Exterior elevation plans show the finished floor height dimensions from the finished grade.
 - Location of existing and proposed buildings, swimming pools, rock/masonry walls, potable/non potable water tanks, fences, ancillary structures, driveway access, septic systems or cesspool, eaves, overhangs and etc.
 - Distance between building(s) and property lines, on-site wastewater disposal (i.e. septic systems, leach field, cesspool) and etc.
 - Location of available underground public or private utilities at the property line: water, gas, sewer and cable/electric.



County of Hawaii, Department of Public Works Building Division
Residential Building Permit Checklist

SUBMITTAL REQUIREMENTS: MUST BE DRAWN TO SCALE AND NOTE THE PAGE DIMENSIONED. CHECK EACH BOX.

FOUNDATION PLAN (LAYOUT AND DIMENSIONS): Layout and dimensions of the foundation including details of the concrete slab, footing, concrete strengths, steel reinforcement placement, anchor bolts, hold-downs, post, pier, sill, joist and etc.

FLOOR PLANS AND SECTIONS FOR EACH FLOOR LEVEL:

Room identification, layout and dimensions of all spaces.

Occupancy use of each room or space identified including square footage tabulation (living, kitchen, master bedroom, bedroom, bathroom, family room, storage, den, patio, lanai, deck, carport, garage, etc.) and total floor area.

Dimensions of counters, cabinets, partitions, built-ins, etc.

Doors/windows schedule and sizes (note bedroom egress window and safety glazing where required), required light and ventilation calculations.

Guardrails & stairways/step details including tread & riser dimensions, nosing, handrails, railing/guard height.

Ceiling heights.

Floor/wall/ceiling dimensions and materials. Indicate if this is new or existing.

Floor/wall/ceiling insulation R-Value if air conditioned or heated.

Kitchen stove top w/ clearances from combustible, water-main, oven, refrigerator, and other fixtures.

Plumbing fixtures (water heater, water closet, lavatory, shower, bath, sink, hose bib, washer/dryer, pressure tanks, pumps), ventilation fans, other fixtures with clearances to electrical fixtures where applicable.

REFLECTED CEILING PLAN: Light fixtures, smoke detectors, ceiling/ventilation fans, supply/exhaust registers, attic access, etc.

ROOF PLAN: Hips, ridges, and valleys with roofing material, slope, overhangs, gutters, downspouts, ventilation, etc.



County of Hawai'i, Department of Public Works Building Division
Residential Building Permit Checklist

SUBMITTAL REQUIREMENTS: MUST BE DRAWN TO SCALE AND NOTE THE PAGE DIMENSIONED. CHECK EACH BOX.

FRAMING PLANS AND SECTIONS FOR EACH FLOOR.

Design Information:

Floor Live Load NA psf

Roof Live Load 20 psf

Basic wind speed 105 mph

Effective Wind Speed 100 mph

Wind Exposure Category B mph

Seismic Design Category D

Floors, Walls, and Roofs layout and dimensions for structural members (joists, beams, rafter, header sizes, spacing, bearing, connection details, attic ventilation, insulation).

Framing member vertical dimension to earth.

Diaphragms: type and thickness of sheathing, span rating, and nailing requirements;

Shear/Braced Walls: location and widths, type/thickness of sheathing, nailing/bolting requirement, strut/cord details. NA

A complete load path: type, placement and amount of connectors, roof strapping, and fasteners. NA

Pre-Engineered Roof Trusses (options):

NA Truss shop drawings and calculation prepared by the professional architect or engineer shall be sealed or stamped and signed with authentication stating; "This work was prepared by me or under my supervision and construction will be under my observation." Observation of pre-engineered truss fabrication may be satisfied through a pre-approved testing or inspecting agency.

NA Framing plans prepared by project architect or structural engineer of record shall identify on plans the pre-engineered roof truss document identification, designer and fabricator, sealed or stamped and signed with authentication stating; "This work was prepared by me or under my supervision and construction will be under my observation."



**County of Hawai'i, Department of Public Works Building Division
Residential Building Permit Checklist**

SUBMITTAL REQUIREMENTS: MUST BE DRAWN TO SCALE AND NOTE THE PAGE DIMENSIONED. CHECK EACH BOX.

NA Truss shop drawings and calculation submitted separately from building permit application, the project architect or engineer of record shall submit a letter identifying the legal property owner, TMK, building application or permit number, pre-engineered roof truss document identification, designer, fabricator, and include a Statement accepting the pre-engineered roof truss design/fabrication and its incorporation into the design/construction, with a letter sealed or stamped and signed with authentication stating: "This work was prepared by me or under my supervision and construction will be under my observation."

EXTERIOR ELEVATION PLANS: Full elevation showing walls, roof, doors, windows, stair, guard, railing, items affixed to exterior structure, dimensions from finished floor and overall height from grade, etc.

NA **INTERIOR ELEVATION PLANS:** Dimension and detail of counters, cabinet and built-in, window heights from the floor, etc.

REQUESTED BY THE PLANS EXAMINER.

**COUNTY OF HAWAI'I DEPARTMENT OF PUBLIC WORKS
BUILDING DIVISION**

HILO OFFICE: 961-8331

KONA OFFICE: 323-4850

PROJECT IDENTIFICATION: 25 M Fully Contained SDZ Range
APPLICATION NO.: A2014-BH00078 TAX MAP KEY NO.: 2-1-13-10-N/A

REQUIREMENTS FOR SPECIAL INSPECTIONS

This is to inform you that Chapter 17 of the International Building Code requires that the owner employ special inspectors, independent of the contractors performing the work, for the following types of work (**only circled numbered inspections required for this project**):

- | | |
|---|--|
| <ol style="list-style-type: none"> 1. Concrete construction 2. Inspection of fabricators 3. Special inspections for seismic resistance 4. Steel construction-Reinforcing Steel/Prestressing Steel, Welding, H.S. Bolting 5. Soils 6. Wood Construction 7. Masonry Construction | <ol style="list-style-type: none"> 8. Pile Foundation 9. Pier foundation 10. Sprayed Fire-resistant Material 11. Mastic and intumescent Fire-resistant Coatings 12. Exterior Insulation and finish System (EIFS) 13. Special Inspection for Smoke Control 14. Special Cases (specify) |
|---|--|

(Clarification of above items are listed in the International Building Code)

Complete information in the following Table A according to the special inspections required above

TABLE A			TABLE B (For Official Use Only)	
Item No.	Identity of Special Inspector (Print)	License Number	Telephone Number	Approved by Plans Examiner (Print)

Duties and Responsibilities of the Special Inspector:

1. Observe work assigned for conformance with approved design drawings and specifications.
2. Furnish inspection reports to the owner, the engineer or architect of record and other owner-designated persons. All discrepancies shall be brought to the immediate attention of the contractor for correction; then, if uncorrected, to proper design authority and to the building official.
3. Prior to the final inspection, the licensed engineer or architect of record shall submit a written statement verifying receipt of the final special inspection reports and documenting that there are no known unresolved code requirements that create significant public safety deficiencies.

PRINT NAME OF ARCHITECT/ENGINEER

TELEPHONE NO.

SIGNATURE OF ARCHITECT/ENGINEER

DATE

<p>FOR OFFICIAL USE ONLY BUILDING PERMIT NO.</p>

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TRANSMITTAL REQUIREMENTS AND CERTIFICATION STATEMENT FOR E-PERMITTING NOTICE OF INTENT (NOI) SUBMISSIONS

1. Submission and File Numbers

e-Permitting Submission #: 1TH-PHYW-7D44

I am submitting a (check only one):

Initial NOI.

Revised NOI, File Number: _____

NOI for an Already Issued NGPC, Current NGPC File Number: _____

2. Certification Statement

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.

Signature _____ Date Signed _____

Printed First and Last Name Marjean R. Stubbert

3. Transmittal Requirements (Check all.)

I have read the instructions on Pages 2 and 3.

If I do not follow all of the instructions on Pages 2 and 3, I acknowledge that:

a. This submittal will not be accepted by the Clean Water Branch (CWB);

b. Processing of my NOI will not begin;

c. I am delaying the processing of my NOI; and

d. The CWB may deny my request for NPDES general permit coverage with or without prejudice.

The signature provided in Item No. 2 is an original signature.

My CD or DVD is attached. This CD or DVD contains only the downloaded e-Permitting submission identified in Item No. 1 above. I have not altered this file.

4. Filing Fee (Check the applicable box.)

A \$500 check made payable to the State of Hawaii is attached.

The filing fee was paid online through the e-Permitting Portal.

I am submitting a Revised NOI. My filing fee has already been paid under the initial submittal.

I am a State agency, and I am requesting a Bill for Collection.

IMPORTANT INSTRUCTIONS:

You are required to follow these instructions to complete your e-Permitting NOI submittal. Failure to follow all of these instructions will delay the processing of your submittal and may result in the denial of your request for NPDES general permit coverage. **Processing of your submission will not begin until the Clean Water Branch (CWB) receives all of the items below.**

Item No. 1 – Submission and File Numbers

- a. Enter your e-Permitting Submission #. You may find your unique e-Permitting Submission # (e.g. 15H-ZGVV-421H) in your History Link of the e-Permitting Portal. If you are submitting a revised NOI, the e-Permitting Submission # will contain the version (e.g. 15H-ZGVV-421H, v1).
- b. Check only one (1) box to indicate if you are submitting an Initial NOI (new submittal) or a Revised NOI (revised submittal to address CWB comments) or a NOI for an Already Issued NGPC (see Item No. 1.d below).
- c. Enter your file number if you are revising an Initial NOI to respond to CWB comments. The CWB comments will contain the file number. You will not need to provide a file number if you are submitting an Initial NOI.
- d. Enter your current NGPC file number if you are submitting a NOI for an Already Issued NGPC. A NOI for an Already Issued NGPC is required if there are any changes to the information previously provided. NGPCs can no longer be modified and reissued. Once the NGPC is issued, any changes to the information provided during the NOI processing (except changes to BMPs) will require another NOI with filing fee and another NGPC to be issued. Upon issuance of the NGPC, the existing NGPC will be terminated.

Item No. 2 – Certification Statement

- a. This is the certification statement for the e-Permitting submission # identified in Item No. 1.
- b. Enter the Printed First and Last Name.
 - i. For an Initial NOI and a NOI for an Already Issued NGPC, the Printed First and Last Name must be the Certifying Person identified in Section No. 2 of the e-Permitting NOI form.
 - ii. For Revised NOI submittals, the Printed First and Last Name may be either the Certifying Person identified in Section No. 2 of the e-Permitting NOI form or the duly authorized representative identified in Section No. 8 of the e-Permitting NOI form.
- c. Enter the Date Signed.
- d. Provide an original Certification signature (hard copy of this form). Someone else may sign “for” the individual listed in the Printed First and Last Name.

Item No. 3 – Transmittal Requirements

- a. You are required to check all of the boxes.
- b. Provide a CD or DVD containing the downloaded e-Permitting submission in PDF or ZIP. To download the submission, click on the History Link in the e-Permitting Portal (after you submitted the application). Locate your submission and press the view button under the Action column. Press the Download Submission button. A PDF file will be generated if you have no attachments. A ZIP file will be created if you have attachments. Check the ZIP file to confirm that all of your attachments uploaded successfully in the e-Permitting Portal. Save the PDF or ZIP file on the CD or DVD. Do not add additional files to the CD or DVD. Your CD or DVD shall match your e-Permitting submission #. Please contact the e-Permitting Administrator at 808-586-4350 if you have trouble uploading a file to the e-Permitting Portal.

Item No. 4 – Filing Fee

- a. You are required to check only one (1) of the boxes.
- b. A \$500 filing fee is required for an Initial NOI and a NOI for an Already Issued NGPC.
- c. If you are a State agency, you may request a Bill for Collection.

Additional

- a. Mail or deliver this form and all attachments to the Department of Health, Clean Water Branch, 919 Ala Moana Boulevard, Room 301, Honolulu, Hawaii 96814.

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HRS 103-50 DOCUMENT TRANSMITTAL FORM

The Department/Agency or Design Consultant submitting plans under §103-50, HRS must complete and submit this form with the construction documents to:

Disability and Communication Access Board
919 Ala Moana Boulevard, Room 101, Honolulu, Hawaii, 96814
Phone: 586-8121 (V/TTY) FAX: 586-8129
<http://www.hawaii.gov/health/dcab>

ATTENTION: _____ Date: _____
(DCAB staff name, only if resubmittal)

Submission stage: New submission Resubmittal (This form is required for all submittals)

Who is submitting? Department/Agency Design Consultant

Items submitted: Drawing prints, specify number of sheets: 43
 Specifications
 Other, please specify: _____

DCAB #: _____ (Refer to previous review if this is a resubmittal)

Project Name: 25 Meter Fully Contained SDZ Range
Location: Keaukaha Military Reservation Island: Hawaii
Agency Project #: 15120001 TMK: 2-1-13-10-N/A

Estimated Construction Cost: \$2,999,000.-- (See reverse side for instruction on
Plan Review Fee: \$50.-- how to calculate the plan review fee.)
 Infrastructure project
 Project managed by a private nonprofit entity
 Project with no elements subject to accessibility guidelines

NOTE: Fill in all information below for both State or County Department/Agency and Design Firm/Consultant

Contact Person: Mr. Morris Onishi
Department/Agency: State of Hawaii, Hawaii Army National Guard
Address, City, State, Zip: 3949 Diamond Head Road
Phone Number: 808-672-1543 Fax: 808-672-1529 Email: morris.m.onishi.nfg@mail.mil

Contact Person: John Bean, P.E.
Design Firm/Consultant: Leidos
Address, City, State, Zip: One West 3rd Suite 200
Phone Number: 918-599-4301 Fax: 918-496-0132 Email: john.b.bean@leidos.com

Project Phase: Conceptual Preliminary Pre-Final Final
 Construction Post Construction

Project Type: New Addition Alteration Transition Plan
 ABR Project Leased Site Historic Site Per Legal Settlement

Comments: Range is per military guidelines to be used only for able bodied personnel
See attached documents

BELOW THIS BOX FOR DISABILITY AND COMMUNICATION ACCESS BOARD USE ONLY

Date Received: _____ Serial Number: _____ Review Date: _____
Check/JV #: _____ Department Code: _____ Turnaround Days: _____
Check/JV Amount: _____ Island Code: _____ Action Taken Code: _____
DCAB Staff: _____ Facility Type Code: _____ SSAD (Y/N): _____

Comments: _____

On or after January 1, 2013, the plan review fee must be provided with the initial submittal of the project plans and specifications. The plan review fee is a one-time fee that covers the project's initial plan review and subsequent resubmittals, unless the project scope of work changes significantly. Payment must be made by check or journal voucher. Make checks payable to: **Disability and Communication Access Board.**

The department/agency or design firm/consultant must determine the estimated construction cost. The estimated construction cost shall be based on the entire project scope of work that is covered under Section 103-50, Hawaii Revised Statutes (HRS §103-50). If the entire project scope of work is covered under HRS §103-50, then the estimated construction cost is based on the entire project. If a portion of the project scope of work is covered under HRS §103-50, then the estimated construction cost is based on the portion of the project covered under HRS §103-50.

The plan review fee shall be four-tenths of one percent (0.004) for the first \$500,000 of the estimated construction cost plus two-tenths of one percent (0.002) of the estimated construction costs greater than \$500,000 up to and including \$2,000,000 plus two one-hundredths of one percent (0.0002) of the estimated construction costs over \$2,000,000 except as follows:

- (1) The minimum review fee for plans and specifications subject to accessibility guidelines is \$200;
- (2) DCAB may limit the maximum review fee for plans and specifications for infrastructure projects or projects managed by private nonprofit entities to \$3,000; and
- (3) There is a \$50 review fee for projects with plans and specifications that do not reflect any elements subject to accessibility guidelines.

Examples of calculating the plan review fee:

Estimated construction cost =	\$250,000
0.004 X \$250,000	= \$1,000
Plan review fee	= \$1,000

Estimated construction cost =	\$1,500,000
0.004 X \$500,000	= \$2,000
0.002 X \$1,000,000	= \$2,000
Plan review fee	= \$4,000

Estimated construction cost =	\$5,000,000
0.004 X \$500,000	= \$2,000
0.002 X \$1,500,000	= \$3,000
0.0002 X \$3,000,000	= \$600
Plan review fee	= \$5,600

Infrastructure projects include water, drainage, sewer, waste disposal and treatment systems, roads, and street lighting projects with minimal work to accessible elements and spaces. Projects with significant work to accessible elements and spaces are not infrastructure projects (e.g., projects to improve sidewalks and curb ramps in the public right-of-way and projects to alter office and common use spaces at a wastewater treatment plant).

Projects managed by nonprofit entities include, but are not limited to, projects that receive state or county funds or federal funds administered by the state or county that are used for the design and/or construction of a building, facility, or site.

Projects with plans and specifications that do not reflect any elements subject to accessibility guidelines are projects where all work is exempt from accessibility guidelines or projects that do not include work that affects accessible spaces or elements (e.g., machinery equipment repair or reroofing).

If a project appears to be exempt from the full plan review fee, the department/agency or design firm/consultant should coordinate with DCAB prior to the initial submittal to confirm the appropriate plan review fee.

ENCLOSURE 1

Note:

The following paragraphs have been extracted from the United States Access Board website: <http://www.access-board.gov/guidelines-and-standards/buildings-and-sites/about-the-aba-standards/ufas#intro> which website presents the Uniform Federal Accessibility Standards (UFAS), and Architectural Barriers Act, 42 U.S.C. 4151-4157:

4.1.4 OCCUPANCY CLASSIFICATIONS. Buildings and facilities shall comply with these standards to the extent noted in this section for various occupancy classifications, unless otherwise modified by a special application section. Occupancy classifications, and the facilities covered under each category include, but are not necessarily limited to, the listing which follows:

(1) GENERAL EXCEPTIONS. Accessibility is not required to elevator pits, elevator penthouses, mechanical rooms, piping or equipment catwalks, lookout galleries, electrical and telephone closets, and general utility rooms.

(2) MILITARY EXCLUSIONS. The following facilities need not be designed to be accessible, but accessibility is recommended since the intended use of the facility may change with time.

(a) Unaccompanied personnel housing, closed messes, vehicle and aircraft maintenance facilities, where all work is performed by able-bodied military personnel and, in general, all facilities which are intended for use or occupancy by able-bodied military personnel only.

(b) Those portions of Reserve and National Guard facilities which are designed and constructed primarily for use by able-bodied military personnel. This exclusion does not apply to those portions of a building or facility which may be open to the public or which may be used by the public during the conduct of normal business or which may be used by physically handicapped persons employed or seeking employment at such building or facility. These portions of the building or facility shall be accessible.

(c) Where the number of accessible spaces required is determined by the design capacity of a facility (such as parking or assembly areas), the number of able-bodied military persons used in determining the design capacity need not be counted when computing the number of accessible spaces required.

(3) MILITARY HOUSING. In the case of military housing, which is primarily available for able-bodied military personnel and their dependents, at least 5 percent of the total but at least one unit (on an installation-by-installation basis) of all housing constructed will be designed and built to be either accessible or readily and easily modifiable to be accessible, but in any event, modification of individual units (including the making of adaptations), will be accomplished on a high priority basis when a requirement is identified. Common areas such as walks, streets, parking and play areas, and common entrances to multi-unit facilities shall be designed and built to be accessible.

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Engineer through Project Manager prior to start of work.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Engineer.
 - c. Engineer's project number.
 - d. Contractor's name and address.

- e. Date of submittal.
2. Arrange schedule of values consistent with format of AIA Document G703.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.
 - a. Include separate line items under required principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Project Manager and paid for by Owner.
1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Application for Payment to Project Manager. The period covered by each Application for Payment is one month.
- D. Application for Payment Forms: Use the guidelines for invoices outlined in FAR 52.232-27 paragraphs (A) (2) (i) thru (A) (2) (xi) as form for Applications for Payment.
- E. Application for Payment Forms: Use forms acceptable to Project Manager for Applications for Payment.
- F. Application Preparation: Complete every entry on form. Execute by a person authorized to sign legal documents on behalf of Contractor. Project Manager will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- G. Transmittal: Submit one signed original of each Application for Payment to Project Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following unless identified otherwise below:
1. List of subcontractors.(Submit to Project Manager prior to Pre-Construction Meeting)
 2. Schedule of values.
 3. Contractor's construction schedule.(Submit to Project Manager prior to Pre-Construction Meeting)
 4. Schedule of unit prices.
 5. Submittal schedule (preliminary if not final).
 6. List of Contractor's staff assignments.
 7. List of Contractor's principal consultants.
 8. Copies of building permits.
 9. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 10. Initial progress report.
 11. Report of preconstruction conference.
 12. Certificates of insurance and insurance policies. Submit to Project Manager prior to Pre-Construction Meeting.)
- J. Application for Payment at Substantial Completion: After Engineer issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- K. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.

2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707-1994, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
9. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project Web site.
 - 4. Project meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Government, Project Manager, Engineer, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate

construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- 1.5 COORDINATION DRAWINGS
- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do

not base coordination drawings on standard printed data.
Include the following information, as applicable:

- a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Project Manager indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans: Show structural elements.
 2. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
 3. Locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, and similar items.
 4. Review: Project Manager will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Engineer and Project Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.

8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Project Manager.
- D. Engineer's and Project Manager's Action: Engineer and Project Manager will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Engineer and Project Manager after 1:00 p.m. will be considered as received the following working day.
1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.
 2. Engineer's action may include a request for additional information, in which case Engineer's time for response will date from time of receipt of additional information.
 3. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Project Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Engineer and Project Manager.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Engineer's and Project Manager's response was received.

F. On receipt of Engineer's and Project Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer and Project Manager within seven days if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.7 PROJECT WEB SITE

A. Use Engineer's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

1.8 PROJECT MEETINGS

A. General: Project Manager will schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Government, Project Manager and Engineer and Architect, within five (5) days of the meeting.
- B. Preconstruction Conference: Project Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Government and Engineer.
1. Attendees: Authorized representatives of Government, Project Manager, Engineer and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.
 - c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.

- y. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer and Project Manager of scheduled meeting dates.
 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Review of mockups.
 - i. Possible conflicts.
 - j. Compatibility problems.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - r. Space and access limitations.
 - s. Regulations of authorities having jurisdiction.
 - t. Testing and inspecting requirements.
 - u. Installation procedures.
 - v. Coordination with other work.
 - w. Required performance results.
 - x. Protection of adjacent work.
 - y. Protection of construction and personnel.
 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are

necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Project Manager will conduct progress meetings at monthly intervals.

1. Attendees: In addition to representatives of Government, Project Manager and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Site condition reports.
- B. Related Requirements:
 - 1. Not Applicable.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- D. Float: The measure of leeway in starting and completing an activity.

1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 1. Working electronic copy of schedule file, where indicated.
 2. PDF electronic file.
 3. Two paper copies.
- B. Startup Network Diagram: Of size required to display entire network for entire construction period. Show logic ties for activities.
- C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
 1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
 2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
 3. Total Float Report: List of all activities sorted in ascending order of total float.
 4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.
- E. Construction Schedule Updating Reports: Submit with Applications for Payment.

- F. Daily Construction Reports: Submit at monthly intervals.
- G. Site Condition Reports: Submit at time of discovery of differing conditions.

1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice of Award to date of Substantial Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.

5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Engineer's and Project Manager administrative procedures necessary for certification of Substantial Completion.
 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

1. Provide electronic files in PDF or MS project format that is P.C. compatible.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.

B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.

- a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

3. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays

incorporated into the schedule in order to coordinate with the Contract Time.

- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing.
 - j. Punch list and final completion.
 - k. Activities occurring following final completion.
 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
9. Average size of workforce.
10. Dollar value of activity (coordinated with the schedule of values).

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.
16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.

- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule to Engineer and Project Manager, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. Post copies in Project meeting rooms and temporary field offices.
 - 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Preconstruction photographs.
 - 2. Periodic construction photographs.
- B. Related Requirements:
 - 1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 INFORMATIONAL SUBMITTALS

- A. Key Plan: Submit key plan of Project site and range with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.
- B. Digital Photographs: Submit unaltered, original, full-size image files within three days of taking photographs.
 - 1. Digital Camera: Minimum sensor resolution of 8 megapixels.
 - 2. Identification: Provide the following information with each image description in file metadata tag:
 - a. Name of Project.
 - b. Name and contact information for photographer.
 - c. Date photograph was taken.
 - d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.3 QUALITY ASSURANCE

- A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction projects for not less than three years.

1.4 USAGE RIGHTS

- A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Digital Images: Provide images in JPG format, with minimum size of 8 megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- C. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in file name for each image.
 - 2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Engineer and Project Manager.
- D. Preconstruction Photographs: Before starting construction, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Project Manager.
 - 1. Flag construction limits before taking construction photographs.
 - 2. Take 20 minimum photographs to show existing conditions adjacent to property before starting the Work.

3. Take 20 minimum photographs of existing structures either on or adjoining property to accurately record physical conditions at start of construction.
- E. Periodic Construction Photographs: Take 20 (minimum) photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.
- F. Final Completion Construction Photographs: Take 20 minimum color photographs after date of Substantial Completion for submission as Project Record Documents. Project Manager will inform photographer of desired vantage points.
- G. Additional Photographs: Engineer or Project Manager may request photographs in addition to periodic photographs specified.
1. Three days' notice will be given, where feasible.
 2. In emergency situations, take additional photographs within 24 hours of request.
 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not subject to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

END OF SECTION 013233

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's and Project Manager's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's and Project Manager's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Engineer's and Project Manager's and additional time for handling and reviewing submittals required by those corrections.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Engineer's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will be provided by Engineer for Contractor's use in preparing submittals.
1. Engineer will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Engineer makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement form acceptable to Owner and Engineer.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer and Construction Manager reserve the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's and Project Manager's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer and Project Manager will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 15 days for review of each resubmittal.
- D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately **6 by 8 inches** on label or beside title block to record Contractor's review and approval markings and action taken by Engineer and Project Manager.
3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Engineer.
 - d. Name of Project Manager.
 - e. Name of Contractor.
 - f. Name of subcontractor.
 - g. Name of supplier.
 - h. Name of manufacturer.
 - i. Submittal number or other unique identifier, including revision identifier.
 - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - j. Number and title of appropriate Specification Section.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Engineer and Project Manager observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer and Project Manager.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer and Project Manager will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use AIA Document G810 or CSI Form 12.1A.
 - b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:

- 1) Project name.
- 2) Date.
- 3) Destination (To:).
- 4) Source (From:).
- 5) Name and address of Engineer.
- 6) Name of Project Manager.
- 7) Name of Contractor.
- 8) Name of firm or entity that prepared submittal.
- 9) Names of subcontractor, manufacturer, and supplier.
- 10) Category and type of submittal.
- 11) Submittal purpose and description.
- 12) Specification Section number and title.
- 13) Specification paragraph number or drawing designation and generic name for each of multiple items.
- 14) Drawing number and detail references, as appropriate.
- 15) Indication of full or partial submittal.
- 16) Transmittal number, numbered consecutively.
- 17) Submittal and transmittal distribution record.
- 18) Remarks.
- 19) Signature of transmitter.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Engineer and Project Manager.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Construction Manager.
 - e. Name of Contractor.

- f. Name of firm or entity that prepared submittal.
 - g. Names of subcontractor, manufacturer, and supplier.
 - h. Category and type of submittal.
 - i. Submittal purpose and description.
 - j. Specification Section number and title.
 - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - l. Drawing number and detail references, as appropriate.
 - m. Location(s) where product is to be installed, as appropriate.
 - n. Related physical samples submitted directly.
 - o. Indication of full or partial submittal.
 - p. Transmittal number, numbered consecutively.
 - q. Submittal and transmittal distribution record.
 - r. Other necessary identification.
 - s. Remarks.
5. Metadata: Include the following information as keywords in the electronic submittal file metadata:
- a. Project name.
 - b. Number and title of appropriate Specification Section.
 - c. Manufacturer name.
 - d. Product name.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 3. Resubmit submittals until they are marked with approval notation from Engineer's and Project Manager's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Engineer's and Project Manager's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:

1. Post electronic submittals as PDF electronic files directly to Engineer's FTP site specifically established for Project.

a. AEngineer will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.

2. Mark each copy of each submittal to show which products and options are applicable.

3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.

b. Manufacturer's product specifications.

c. Standard color charts.

d. Statement of compliance with specified referenced standards.

e. Testing by recognized testing agency.

f. Application of testing agency labels and seals.

g. Notation of coordination requirements.

h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.

b. Printed performance curves.

c. Operational range diagrams.

d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.

6. Submit Product Data in the following format:

a. PDF electronic file.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless

submittal based on Architect's digital data drawing files is otherwise permitted.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches**, but no larger than **30 by 42 inches**.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Two opaque (bond) copies of each submittal. Engineer, through Project Manager, will return one copy(ies).
 - c. Three opaque copies of each submittal. Engineer and Project Manager will retain two copies; remainder will be returned.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout

the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

- a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
- a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Engineer, through Project Manager, will return submittal with options selected.
6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
- a. Number of Samples: Submit three sets of Samples. Engineer and Project Manager will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Submit product schedule in the following format:

a. PDF electronic file.

- F. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- U. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Project Manager.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer and Project Manager.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ENGINEER'S AND PROJECT MANAGER'S ACTION

- A. General: Engineer and Project Manager will not review submittals that do not bear Contractor's approval stamp and will return them without action.

- B. Action Submittals: Engineer and Project Manager will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer and Project Manager will stamp each submittal with an action stamp and will mark stamp appropriately to indicate **action**.
- C. Informational Submittals: Engineer and Project Manager will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer and Project Manager will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 013529 - SAFETY AND OCCUPATIONAL HEALTH REQUIREMENTS

PART 1 - GENERAL

1.1 REFERENCES

- A. 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.
- B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
 - 1. ANSI Z359.1(2007) Safety Requirements for Personal Fall Arrest Systems, Subsystems and Components
- C. ASME INTERNATIONAL (ASME)
 - 1. ASME B30.5(2007) Mobile and Locomotive Cranes
 - 2. ASME B30.8(2004) Floating Cranes and Floating Derricks
 - 3. ASME B30.22(2005) Articulating Boom Cranes
- D. OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)
 - 1. 29 CFR 1910 Safety and Health Regulation in General Industry
 - 2. 29 CFR 1910.94 Ventilation
 - 3. 29 CFR 1910.120 Hazardous Waste Operations and Emergency Response
 - 4. 29 CFR 1910.146 Permit-required Confined Spaces
 - 5. 29 CFR 1915 Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment
 - 6. 29 CFR 1926 Safety and Health Regulations for Construction
 - 7. 29 CFR 1926.65 Hazardous Waste Operations and Emergency Response
 - 8. 29 CFR 1926.500 Fall Protection
 - 9.
- E. U. S. ARMY CORPS OF ENGINEERS (USACE)
 - 1. EM 385-1-1(2003) Safety and Health Requirements Manual
- F. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)
 - 1. NFPA 10 (2007) Portable Fire Extinguishers
 - 2. NFPA 70 (2007) National Electrical Code
 - 3. NFPA 241(2009) Safeguarding Construction, Alteration, and Demolition Operations

1.2 SUBMITTALS

- A. 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 013300
SUBMITTAL PROCEDURES:

1. SD-01 Preconstruction Submittals
 - a. Accident Prevention Plan (APP); G
 - b. Activity Hazard Analysis (AHA); G
 - c. Crane Critical Lift Plan; G
2. SD-06 Test Reports
 - a. Reports
 - b. Submit reports as their incidence occurs, in accordance with the requirements of the paragraph entitled, "Reports."
 - c. Accident Reports
 - d. Monthly Exposure Reports
 - e. Regulatory Citations and Violations
 - f. Crane Reports
 - g. Certificate of Compliance (Crane)

1.3 DEFINITIONS

- A. High Visibility Accident. Any mishap which may generate publicity and/or high visibility.
- B. Low-slope roof. A roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- C. 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.
- D. 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.
- E. 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.).
- F. 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.
- G. 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 Contractor quality control (QC) person can be the SSHO on this project.
- H. Steep roof. A roof having a slope greater than 4 in 12 (vertical to horizontal).
- I. Weight Handling Equipment (WHE) Accident. A WHE accident occurs when any one or more of the six elements in the operating envelope fails to perform correctly during operation, including operation during maintenance or testing resulting in personnel injury or death; material or equipment damage; dropped load; derailment; two-blocking; overload; and collision, including unplanned contact between the load, crane, and/or other objects. A dropped load, derailment, two-blocking, overload and collision are considered accidents even though no material damage or injury occurs. A component failure (e.g., motor burnout, gear tooth failure, bearing failure) is not considered an accident solely due to material or equipment damage unless the component failure results in damage to other components (e.g., dropped boom, dropped load, roll over, etc.).

1.4 REGULATORY REQUIREMENTS

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

- A. 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 Project Manager upon request.

1.6 SITE QUALIFICATIONS, DUTIES AND MEETINGS

A. Personnel Qualifications

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:
 - a. Level 2:
 - 1) A minimum of 3 years safety work on similar project.
 - 2) 30-hour OSHA construction safety class or equivalent within last 3 years.
 - 3) Competent person training as needed.
2. Crane Operators: Crane operators shall meet the requirements in USACE EM 385-1-1, Appendix G.

B. Personnel Duties

1. Site Safety and Health Officer (SSHO)/Superintendent
 - 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 production 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.
2. Failure to perform the above duties will result in dismissal of the superintendent and/or SSHO, and a project work stoppage. The project work stoppage will remain in effect pending approval of a suitable replacement.

C. Meetings

1. Preconstruction Conference
 - a. The Contractor will be informed, in writing, of the date of the preconstruction conference. The purpose of the preconstruction conference is for the Contractor and the Project Manager '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 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 preconstruction conference. 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 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 activity hazard analyses (AHAs) that will be developed and implemented during the performance of the contract. This list of proposed AHAs will be reviewed at the conference and an agreement will be reached between the Contractor and the Project Manager '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 preconstruction conference, 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.
2. Weekly Safety Meetings: Conduct weekly safety meetings at the project site for all employees. The Project Manager 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 production report.
3. Work Phase 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

- A. 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.
- B. 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.
- C. Training on Activity Hazard Analysis (AHA): Prior to beginning a new phase, training will be provided to all affected employees to include a review of the AHA to be implemented.

1.8 ACCIDENT PREVENTION PLAN (APP)

- A. 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 1.8.1. The APP shall be job-specific and shall address any unusual or 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. 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.
- B. Submit the APP to the Project Manager 15 calendar days prior to the date of the preconstruction conference for acceptance. Work cannot proceed without an accepted APP. The Project Manager reviews and comments on the Contractor's submitted APP and

accepts it when it meets the requirements of the contract provisions.

- C. Once accepted by the Project Manager, 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 Project Manager, until the matter has been rectified.
- D. Once work begins, changes to the accepted APP shall be made with the knowledge and concurrence of the Project Manager, project superintendent, SSHO and quality control manager. Should any unforeseen hazard become evident during the performance of work, the project superintendent shall inform the Project Manager, 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.
- E. Copies of the accepted plan will be maintained at the Project Manager 's office and 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.
- F. EM 385-1-1 Contents: In addition to the requirements outlines in Appendix A of USACE EM 385-1-1, the following is required:
 - 1. 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.
 - 2. 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; scaffolding; fall protection; hazardous energy; confined space; health hazard recognition, evaluation and control of chemical, physical and biological agents; personal protective equipment and clothing to include selection, use and maintenance.
 - 3. Confined Space Entry Plan. Develop a confined space entry plan in accordance with USACE EM 385-1-1, applicable OSHA standards 29 CFR 1910, 29 CFR 1915, and 29 CFR 1926, and any other federal, state and local regulatory requirements identified in this contract. Identify the qualified person's name and qualifications, training, and experience. Delineate the qualified person's authority to direct work stoppage in the event of hazardous conditions. Include

procedure for rescue by contractor personnel and the coordination with emergency responders. (If there is no confined space work, include a statement that no confined space work exists and none will be created.)

4. 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.
5. Crane Critical Lift Plan. Prepare and sign weight handling critical lift plans for lifts over 75 percent of crane hoist's maximum load limit; lifts involving more than one crane or hoist; lifts of personnel; and technically difficult lifts involving non-routine rigging or operation, sensitive equipment, or unusual safety risks in accordance with USACE EM 385-1-1, paragraph 16.c.18. and submit 15 calendar days prior to on-site work.
6. Alcohol and Drug Abuse Plan
 - a. 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."
 - b. Description of the on-site prevention program
7. 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 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, rescue and escape equipment and operations, training requirements, and monitoring methods. Fall Protection and Prevention Plan shall be revised 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.
8. Lead Abatement Plan. The safety and health aspects of lead-based paint removal, prepared in accordance with Section 13281A, Lead Hazard Control Activities.
9. Site Demolition Plan. The safety and health aspects prepared in accordance with Section 02220A, Demolition.
10. Excavation Plan. The safety and health aspects prepared in accordance with Section 02302N, Backfilling, and Compacting for Utilities.
11. Training Records and Requirements. List of mandatory training and certifications which are applicable to this project (e.g. explosive actuated tools, 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.

1.9 ACTIVITY HAZARD ANALYSIS (AHA)

- A. The Activity Hazard Analysis (AHA) format shall be in accordance with USACE EM 385-1-1. Submit the AHA for review at least 15 calendar days prior to the start of each phase. 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 phase 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 phase of work. For work with fall hazards, including fall hazards associated with scaffold erection and removal, identify the appropriate fall arrest systems. 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 Project Manager'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.
- B. 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.
- C. 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

- A. Within 15 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:
1. Map denoting the route to the nearest emergency care facility.
 2. Emergency phone numbers.
 3. Copy of the most up-to-date APP.
 4. AHA(s).
 5. OSHA 300A Form.
 6. OSHA Safety and Health Protection-On-The-Job Poster.

1.11 SITE SAFETY REFERENCE MATERIALS

- A. 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

- A. Contractors will arrange for their own emergency medical treatment. Government has no responsibility to provide emergency medical treatment. Notify COTR and Range Control Fire Desk (918-549-6041) if an ambulance has been called.

1.13 REPORTS

- A. Accident Reports: 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 Project Manager within 1 calendar day(s) of the accident. The Project Manager will provide copies of any required or special forms.
- B. Accident Notification: Notify the Project Manager 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, or any weight handling equipment accident involving a overturned crane, collapsed boom, or any other major damage to the crane or adjacent property. 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.

- C. Monthly Exposure Reports: Monthly exposure reporting to the Project Manager 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 Project Manager will provide copies of any special forms.
- D. Regulatory Citations and Violations: Contact the Project Manager immediately of any OSHA or other regulatory agency inspection or visit, and provide the Project Manager with a copy of each citation, report, and contractor response. Correct violations and citations promptly and provide written corrective actions to the Project Manager.
- E. 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.
- F. Certificate of Compliance: The Contractor shall provide a Certificate of Compliance for each crane entering an activity under this contract (see Project Manager for a blank certificate). Certificate shall state that the crane and rigging gear meet applicable OSHA regulations (with the Contractor citing which OSHA regulations are applicable, e.g., cranes used in construction, demolition, or maintenance shall comply with 29 CFR 1926 and USACE EM 385-1-1 section 16 and Appendix H. Certify on the Certificate of Compliance that the crane operator(s) is qualified and trained in the operation of the crane to be used. The Contractor shall also certify that all of its crane operators working on the project have been trained in the proper use of all safety devices (e.g., anti-two block devices). These certifications shall be posted on the crane.

1.14 HOT WORK

- A. 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.
 - 1. 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.
2. 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.
 3. The storage of combustible supplies shall be a safe distance from structures.
 4. Area outside the facility undergoing work shall be cleaned of trash, paper, or other discarded combustibles at the close of each workday.
 5. All portable electric devices (saws, sanders, compressors, extension chord, lights, etc.) shall be disconnected at the close of each workday.
 6. When starting work in the facility, Contractors shall require their personnel to place in memory the emergency phone number.

PART 2 - PRODUCTS

2.1 FALL PROTECTION ANCHORAGE

- A. Fall protection anchorage, conforming to ANSI Z359.1, will be left in place and so identified for continued customer use.

PART 3 - EXECUTION

3.1 CONSTRUCTION AND/OR OTHER WORK

- A. The Contractor shall comply with USACE EM 385-1-1, NFPA 241, the APP, the AHA, and other related submittals and activity fire and safety regulations.
- B. 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 Project Manager of protective measures and storage area is required prior to the start of the work.

- C. 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 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 Project Manager, upon written request by the Contractor, may consider exceptions to the use of any of the above excluded materials.
- D. 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 Project Manager 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 FALL HAZARD PROTECTION AND PREVENTION

- A. The Contractor shall establish a fall protection and prevention program, for the protection of all employees exposed to fall hazards. The program shall include company policy, identify responsibilities, education and training requirements, fall hazard identification, prevention and control measures, inspection, storage, care and maintenance of fall protection equipment and rescue and escape procedures.
- B. Training: The Contractor shall institute a fall protection training program. As part of the Fall Hazard Protection and Prevention Program, the Contractor shall provide training for each employee who might be exposed to fall hazards. Training requirements shall be in accordance with USACE EM 385-1-1, section 21.A.16.
- C. Fall Protection Equipment: The Contractor shall enforce use of the fall protection equipment designated for each specific work activity in the Fall Protection and Prevention Plan and/or AHA at all times when an employee is on a surface 1.8 m(6 feet) or more above lower levels. Fall protection systems such as guardrails, personnel fall arrest system, safety nets, etc., are required when working within 1.8m (6 feet) of any leading edge. In addition to the required fall protection systems, safety

skiff, personal floatation devices, life rings etc., are required when working above or next to water in accordance with USACE EM 385-1-1, paragraphs 05.I. and 05.J. Personal fall arrest systems are required when working from an articulating or extendible boom, swing stages, or suspended platform. In addition, personal fall arrest systems may be required when operating other equipment such as scissor lifts if the work platform is capable of being positioned outside the wheelbase. Fall protection must comply with 29 CFR 1926.500, Subpart M and USACE EM 385-1-1.

1. Personal Fall Arrest Equipment: Personal fall arrest equipment, systems, subsystems, and components shall meet ANSI Z359.1. Only a full-body harness with a shock-absorbing lanyard or self-retracting lanyard is an acceptable personal fall arrest device. Body belts may only be used as a positioning device system (for uses such as steel reinforcing assembly and in addition to an approved fall arrest system). Harnesses shall have a fall arrest attachment affixed to the body support (usually a Dorsal D-ring) and specifically designated for attachment to the rest of the system. Only locking snap hooks and carabiners shall be used. Webbing, straps, and ropes shall be made of synthetic fiber. The maximum free fall distance when using fall arrest equipment shall not exceed 1.8 m (6 feet). The total fall distance shall always be taken into consideration when attaching a person to a fall arrest system.

D. Fall Protection for Roofing Work: Fall protection controls shall be implemented based on the type of roof being constructed and work being performed. The roof area to be accessed shall be evaluated for its structural integrity including weight-bearing capabilities for the projected loading.

1. Low Sloped Roofs:

a.

b. For work within 1.8 m (6 feet) of an edge, on low-slope roofs, personnel shall be protected from falling by use of personal fall arrest systems, guardrails, or safety nets.

c. For work greater than 1.8 m (6 feet) from an edge, warning lines shall be erected and installed in accordance with 29 CFR 1926.500 and USACE EM 385-1-1.

E.

3.3 SCAFFOLDING

A. Employees shall be provided with a safe means of access to the work area on the scaffold. Climbing of any scaffold braces or supports not specifically designed for access is prohibited. Access to scaffold platforms greater than 6 m (20 feet) in

height shall be accessed by use of a scaffold stair system. Vertical ladders commonly provided by scaffold system manufacturers shall not be used for accessing scaffold platforms greater than 6 m (20 feet) in height. The use of an adequate gate is required. Contractor shall ensure that employees are qualified to perform scaffold erection and dismantling. Do not use scaffold without the capability of supporting at least four times the maximum intended load or without appropriate fall protection as delineated in the accepted fall protection and prevention plan. Stationary scaffolds must be attached to structural building components to safeguard against tipping forward or backward. Special care shall be given to ensure scaffold systems are not overloaded. Side brackets used to extend scaffold platforms on self-supported scaffold systems for the storage of material is prohibited. The first tie-in shall be at the height equal to 4 times the width of the smallest dimension of the scaffold base. Work platforms shall be placed on mud sills. Scaffold or work platform erectors shall have fall protection during the erection and dismantling of scaffolding or work platforms that are more than six feet. Delineate fall protection requirements when working above six feet or above dangerous operations in the Fall Protection and Prevention (FP&P) Plan and Activity Hazard Analysis (AHA) for the phase of work.

3.4 EQUIPMENT

A. Material Handling Equipment

1. 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.
2. The use of hooks on equipment for lifting of material must be in accordance with manufacturer's printed instructions.
3. Operators of forklifts or power industrial trucks shall be licensed in accordance with OSHA.

B. Weight Handling Equipment

1. Cranes must be equipped with:
 - a. Load indicating devices (LIDs) and a boom angle or radius indicator,
 - b. or load moment indicating devices (LMIs).
 - c. Anti-two block prevention devices.
 - d. Boom hoist hydraulic relief valve, disconnect, or shutoff (stops hoist when boom reaches a predetermined high angle).
 - e. Boom length indicator (for telescoping booms).
 - f. Device to prevent uncontrolled lowering of a telescoping hydraulic boom.
 - g. Device to prevent uncontrolled retraction of a telescoping hydraulic boom.

2. The Contractor shall notify the Project Manager 15 days in advance of any cranes entering the activity so that necessary quality assurance spot checks can be coordinated. Contractor's operator shall remain with the crane during the spot check.
3. The Contractor shall comply with the crane manufacturer's specifications and limitations for erection and operation of cranes and hoists used in support of the work. Erection shall be performed under the supervision of a designated person (as defined in ASME B30.5). All testing shall be performed in accordance with the manufacturer's recommended procedures.
4. The Contractor shall comply with ASME B30.5 for mobile and locomotive cranes, ASME B30.22 for articulating boom cranes and ASME B30.8 for floating cranes and floating derricks.
5. The presence of Government personnel does not relieve the Contractor of an obligation to comply with all applicable safety regulations. The Government will investigate all complaints of unsafe or unhealthful working conditions received in writing from contractor employees, federal civilian employees, or military personnel.
6. Each load shall be rigged/attached independently to the hook/master-link in such a fashion that the load cannot slide or otherwise become detached. Christmas-tree lifting (multiple rigged materials) is not allowed.
7. Under no circumstance shall a Contractor make a lift at or above 90% of the cranes rated capacity in any configuration.
8. When operating in the vicinity of overhead transmission lines, operators and riggers shall be alert to this special hazard and shall follow the requirements of USACE EM 385-1-1 section 11 and ASME B30.5 or ASME B30.22 as applicable.
9. Crane suspended personnel work platforms (baskets) shall not be used unless the Contractor proves that using any other access to the work location would provide a greater hazard to the workers or is impossible. Personnel shall not be lifted with a line hoist or friction crane.
10. A fire extinguisher having a minimum rating of 10BC and a minimum nominal capacity of 5lb of extinguishing agent shall be available at all operator stations or crane cabs. Portable fire extinguishers shall be inspected, maintained, and recharged as specified in NFPA 10, Standard for Portable Fire Extinguishers.
11. All employees shall be kept clear of loads about to be lifted and of suspended loads.
12. A weight handling equipment operator shall not leave his position at the controls while a load is suspended.
13. Only Contractor crane operators who have met the requirements of 29 CFR 1910.94, 29 CFR 1910.120, 29 CFR 1926.65, 29 CFR 1926.500, USACE EM 385-1-1, ASME B30.5, and ASME B30.22 and other local and state requirements shall be authorized to operate the crane.

14. The Contractor shall use cribbing when performing lifts on outriggers.
15. The crane hook/block must be positioned directly over the load. Side loading of the crane is prohibited.
16. A physical barricade must be positioned to prevent personnel from entering the counterweight swing (tail swing) area of the crane.
17. A substantial and durable rating chart containing legible letters and figures shall be provided with each crane and securely mounted onto the crane cab in a location allowing easy reading by the operator while seated in the control station.
18. Certification records which include the date of inspection, signature of the person performing the inspection, and the serial number or other identifier of the crane that was inspected shall always be available for review by Project Manager personnel.
19. Written reports listing the load test procedures used along with any repairs or alterations performed on the crane shall be available for review by Project Manager personnel.
20. The Contractor shall certify that all crane operators have been trained in proper use of all safety devices (e.g. anti-two block devices).

C. Equipment and Mechanized Equipment

1. Equipment shall be operated by designated qualified operators. Proof of qualifications shall be kept on the project site for review.
2. 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.
3. 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.
4. Daily checks or tests shall be conducted and documented on equipment and mechanized equipment by designated competent persons.

3.5 EXCAVATIONS

- A. 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.

- B. Utility Locations: All underground utilities in the work area must be positively identified by a private utility locating service. Any markings made during the utility investigation must be maintained throughout the contract.
- C. 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 .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.
- D. 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.
- E. 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.

3.6 CRYSTALLINE SILICA

- A. 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

- A. 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.

- B. Dust control: In addition to the dust control measures required elsewhere in the contract documents, dry cutting of brick or masonry shall be prohibited. The Project Manager, upon written request by the Contractor, may consider exceptions to this prohibition on a case-by-case basis. Wet cutting must address control of water run off.

END OF SECTION 013529

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Engineer, Government Project Manager or authorities having jurisdiction are not limited by provisions of this Section.
 - 3. Specific test and inspection requirements are not specified in this Section.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Engineer or Project Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.

1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to verify performance characteristics.
 - D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
 - E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
 - F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
 - G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
 - H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
 - I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
 - J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of **five** previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- 1.3 CONFLICTING REQUIREMENTS
- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer

conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
 - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Engineer.
 - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Engineer.
- B. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
 - 1. Date of issue.
 - 2. Project title and number.
 - 3. Name, address, and telephone number of testing agency.
 - 4. Dates and locations of samples and tests or inspections.
 - 5. Names of individuals making tests and inspections.
 - 6. Description of the Work and test and inspection method.
 - 7. Identification of product and Specification Section.
 - 8. Complete test or inspection data.
 - 9. Test and inspection results and an interpretation of test results.
 - 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
5. Other required items indicated in individual Specification Sections.

C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

- d. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Engineer, through Project Manager, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Engineer and Project Manager.
 2. Notify Engineer and Project Manager seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Engineer's and Project Manager's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed unless otherwise indicated.
- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.
- 1.7 QUALITY CONTROL
- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to

Contractor, and the Contract Sum will be adjusted by Change Order.

- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. Testing Agency Responsibilities: Cooperate with Project Manager and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Project Manager, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.
- 1.8 SPECIAL TESTS AND INSPECTIONS
- A. Special Tests and Inspections: Engage a qualified testing agency] to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
- B. Special Tests and Inspections: Conducted by a qualified testing agency as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Project Manager and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Engineer, through Project Manager, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Engineer's and Project Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams

that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Engineer's action on Contractor's submittals, applications, and requests, "approved" is limited to Engineer's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Engineer. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
 - 1. AABC - Associated Air Balance Council; www.aabc.com.
 - 2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
 - 3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
 - 4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
 - 5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
 - 6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
 - 7. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org.
 - 8. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
 - 9. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.

10. AF&PA - American Forest & Paper Association;
www.afandpa.org.
11. AGA - American Gas Association; www.aga.org.
12. AHAM - Association of Home Appliance Manufacturers;
www.aham.org.
13. AHRI - Air-Conditioning, Heating, and Refrigeration
Institute (The); www.ahrinet.org.
14. AI - Asphalt Institute; www.asphaltinstitute.org.
15. AIA - American Institute of Architects (The); www.aia.org.
16. AISC - American Institute of Steel Construction;
www.aisc.org.
17. AISI - American Iron and Steel Institute; www.steel.org.
18. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
19. AMCA - Air Movement and Control Association International,
Inc.; www.amca.org.
20. ANSI - American National Standards Institute; www.ansi.org.
21. AOSA - Association of Official Seed Analysts, Inc.;
www.aosaseed.com.
22. APA - APA - The Engineered Wood Association;
www.apawood.org.
23. APA - Architectural Precast Association;
www.archprecast.org.
24. API - American Petroleum Institute; www.api.org.
25. ARI - Air-Conditioning & Refrigeration Institute; (See
AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association;
www.asphaltroofing.org.
28. ASCE - American Society of Civil Engineers; www.asce.org.
29. ASCE/SEI - American Society of Civil Engineers/Structural
Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and
Air-Conditioning Engineers; www.ashrae.org.
31. ASME - ASME International; (American Society of Mechanical
Engineers); www.asme.org.
32. ASSE - American Society of Safety Engineers (The);
www.asse.org.
33. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
34. ASTM - ASTM International; (American Society for Testing
and Materials International); www.astm.org.
35. ATIS - Alliance for Telecommunications Industry Solutions;
www.atis.org.
36. AWEA - American Wind Energy Association; www.awea.org.
37. AWI - Architectural Woodwork Institute; www.awinet.org.
38. AWMAC - Architectural Woodwork Manufacturers Association of
Canada; www.awmac.com.
39. AWPA - American Wood Protection Association; (Formerly:
American Wood-Preservers' Association); www.awpa.com.
40. AWS - American Welding Society; www.aws.org.

41. AWWA - American Water Works Association; www.awwa.org.
42. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
43. BIA - Brick Industry Association (The); www.gobrick.com.
44. BICSI - BICSI, Inc.; www.bicsi.org.
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.com.
46. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bwfbadminton.org.
49. CDA - Copper Development Association; www.copper.org.
50. CEA - Canadian Electricity Association; www.electricity.ca.
51. CEA - Consumer Electronics Association; www.ce.org.
52. CFFA - Chemical Fabrics & Film Association, Inc.; www.chemicalfabricsandfilm.com.
53. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
54. CGA - Compressed Gas Association; www.cganet.com.
55. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
56. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
57. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
58. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
59. CPA - Composite Panel Association; www.pbmdf.com.
60. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
61. CRRC - Cool Roof Rating Council; www.coolroofs.org.
62. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
63. CSA - Canadian Standards Association; www.csa.ca.
64. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
65. CSI - Construction Specifications Institute (The); www.csinet.org.
66. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
70. DHI - Door and Hardware Institute; www.dhi.org.
71. ECA - Electronic Components Association; www.ec-central.org.
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; www.eima.com.

75. EJMA - Expansion Joint Manufacturers Association, Inc.;
www.ejma.org.
76. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org.
77. ESTA - Entertainment Services and Technology Association;
(See PLASA).
78. EVO - Efficiency Valuation Organization; www.evo-world.org.
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
81. FM Approvals - FM Approvals LLC; www.fmglobal.com.
82. FM Global - FM Global; (Formerly: FMG - FM Global);
www.fmglobal.com.
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridarroof.com.
84. FSA - Fluid Sealing Association; www.fluidsealing.com.
85. FSC - Forest Stewardship Council U.S.; www.fscus.org.
86. GA - Gypsum Association; www.gypsum.org.
87. GANA - Glass Association of North America;
www.glasswebsite.com.
88. GS - Green Seal; www.greenseal.org.
89. HI - Hydraulic Institute; www.pumps.org.
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
93. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
94. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; www.iccsafe.org.
98. ICEA - Insulated Cable Engineers Association, Inc.;
www.icea.net.
99. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
100. ICRI - International Concrete Repair Institute, Inc.;
www.icri.org.
101. IEC - International Electrotechnical Commission;
www.iec.ch.
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America);
www.ies.org.
104. IESNA - Illuminating Engineering Society of North America;
(See IES).
105. IEST - Institute of Environmental Sciences and Technology;
www.iest.org.

106. IGMA - Insulating Glass Manufacturers Alliance;
www.igmaonline.org.
107. IGSHPA - International Ground Source Heat Pump Association;
www.igshpa.okstate.edu.
108. ILI - Indiana Limestone Institute of America, Inc.;
www.iliai.com.
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society);
www.isa.org.
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
113. ISO - International Organization for Standardization;
www.iso.org.
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union;
www.itu.int/home.
116. KCMA - Kitchen Cabinet Manufacturers Association;
www.kcma.org.
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; www.lightning.org.
119. MBMA - Metal Building Manufacturers Association;
www.mbma.com.
120. MCA - Metal Construction Association;
www.metalconstruction.org.
121. MFMA - Maple Flooring Manufacturers Association, Inc.;
www.maplefloor.org.
122. MFMA - Metal Framing Manufacturers Association, Inc.;
www.metalframingmfg.org.
123. MHIA - Material Handling Industry of America; www.mhia.org.
124. MIA - Marble Institute of America; www.marble-institute.com.
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association);
www.wmmpa.com.
126. MPI - Master Painters Institute; www.paintinfo.com.
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
128. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
129. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
130. NADCA - National Air Duct Cleaners Association;
www.nadca.com.
131. NAIMA - North American Insulation Manufacturers Association; www.naima.org.

132. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
133. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
134. NCMA - National Concrete Masonry Association; www.ncma.org.
135. NEBB - National Environmental Balancing Bureau; www.nebb.org.
136. NECA - National Electrical Contractors Association; www.necanet.org.
137. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
138. NEMA - National Electrical Manufacturers Association; www.nema.org.
139. NETA - InterNational Electrical Testing Association; www.netaworld.org.
140. NFHS - National Federation of State High School Associations; www.nfhs.org.
141. NFPA - NFPA; (National Fire Protection Association); www.nfpa.org.
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; www.nfrc.org.
144. NHLA - National Hardwood Lumber Association; www.nhla.com.
145. NLGA - National Lumber Grades Authority; www.nlga.org.
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
148. NRCA - National Roofing Contractors Association; www.nrca.net.
149. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
150. NSF - NSF International; (National Sanitation Foundation International); www.nsf.org.
151. NSPE - National Society of Professional Engineers; www.nspe.org.
152. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
154. NWFA - National Wood Flooring Association; www.nwfa.org.
155. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
156. PDI - Plumbing & Drainage Institute; www.pdionline.org.
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); www.plasa.org.
158. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
159. RFCI - Resilient Floor Covering Institute; www.rfci.com.
160. RIS - Redwood Inspection Service; www.redwoodinspection.com.
161. SAE - SAE International; (Society of Automotive Engineers); www.sae.org.

162. SCTE - Society of Cable Telecommunications Engineers;
www.scte.org.
163. SDI - Steel Deck Institute; www.sdi.org.
164. SDI - Steel Door Institute; www.steeldoor.org.
165. SEFA - Scientific Equipment and Furniture Association;
www.sefalabs.com.
166. SEI/ASCE - Structural Engineering Institute/American
Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; www.siaonline.org.
168. SJI - Steel Joist Institute; www.steeljoist.org.
169. SMA - Screen Manufacturers Association; www.smainfo.org.
170. SMACNA - Sheet Metal and Air Conditioning Contractors'
National Association; www.smacna.org.
171. SMPTE - Society of Motion Picture and Television Engineers;
www.smpte.org.
172. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
173. SPIB - Southern Pine Inspection Bureau; www.spib.org.
174. SPRI - Single Ply Roofing Industry; www.spri.org.
175. SRCC - Solar Rating and Certification Corporation;
www.solar-rating.org.
176. SSINA - Specialty Steel Industry of North America;
www.ssina.com.
177. SSPC - SSPC: The Society for Protective Coatings;
www.sspc.org.
178. STI - Steel Tank Institute; www.steeltank.com.
179. SWI - Steel Window Institute; www.steelwindows.com.
180. SWPA - Submersible Wastewater Pump Association;
www.swpa.org.
181. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile
Council of America); www.tileusa.com.
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.;
www.tema.org.
184. TIA - Telecommunications Industry Association; (Formerly:
TIA/EIA - Telecommunications Industry
Association/Electronic Industries Alliance);
www.tiaonline.org.
185. TIA/EIA - Telecommunications Industry
Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; www.masonrysociety.org.
187. TPI - Truss Plate Institute; www.tpinst.org.
188. TPI - Turfgrass Producers International;
www.turfgrasssod.org.
189. TRI - Tile Roofing Institute; www.tilerroofing.org.
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; www.ul.com.
192. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
193. USAV - USA Volleyball; www.usavolleyball.org.
194. USGBC - U.S. Green Building Council; www.usgbc.org.
195. USITT - United States Institute for Theatre Technology,
Inc.; www.usitt.org.

196. WASTEC - Waste Equipment Technology Association;
www.wastec.org.
197. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
198. WCMA - Window Covering Manufacturers Association;
www.wcmanet.org.
199. WDMA - Window & Door Manufacturers Association;
www.wdma.com.
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork
Institute of California); www.wicnet.org.
201. WMPA - Wood Moulding & Millwork Producers Association;
(See MMPA).
202. WSRCA - Western States Roofing Contractors Association;
www.wsrca.com.
203. WPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and
Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.
4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of
Standards and Technology; www.nist.gov.
4. DOD - HI - State of Hawaii, Department of Defense;
www.dod.hawaii.gov.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development;
www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental
Energy Technologies Division; http://eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration;
www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative
Highway Research Program; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research
Service; U.S. Salinity Laboratory; www.ars.usda.gov.

16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeia; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
 - a. Available from Defense Standardization Program; www.dsp.dla.mil.
 - b. Available from General Services Administration; www.gsa.gov.
 - c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.
6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.

1. DCCA - State of Hawaii; Department of Commerce and Consumer Affairs, www.cca.hawaii.gov.
2. DBEDT - State of Hawaii; Department of Business, Economic Development & Tourism, Hawaii State Energy Office, <http://energy.hawaii.gov/hawaii-energy-building-code>.
3. DOFAW - State of Hawaii; Department of Land & Natural Resources, Division of Forestry & Wildlife, www.dlnr.hawaii.gov/dofaw/.
4. DOH - State of Hawaii; Department of Health, www.health.hawaii.gov.
5. PCU - State of Hawaii; Public Utilities Commission, www.puc.hawaii.gov.

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Government's construction forces, Project Manager, occupants of Project, testing agencies, and authorities having jurisdiction.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fencing: Minimum ~~2-inch~~, ~~0.148-inch~~ thick, galvanized-steel, chain-link fabric fencing; minimum ~~6 feet~~ high with galvanized-steel pipe posts; minimum ~~2-3/8-inch~~ OD line posts and ~~2-7/8-inch~~ OD corner and pull posts, with galvanized barbed-wire top strand.
- B. Portable Chain-Link Fencing: Minimum ~~2-inch~~, ~~0.148-inch~~ thick, galvanized-steel, chain-link fabric fencing; minimum ~~6 feet~~ high with galvanized-steel pipe posts; minimum ~~2-3/8-inch~~ OD line posts and ~~2-7/8-inch~~ OD corner and pull posts, with ~~1-5/8-inch~~ OD top and bottom rails. Provide concrete or galvanized-steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of Owner, Project Manager, and construction personnel office activities and to accommodate Project meetings specified in other Division 01 Sections. Keep office clean and orderly.
- C. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: There are no utility services located at the project site.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
- C. Water Service: There is no potable water service at project site.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
- E. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- F. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
- G. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements.
2. At Construction sign, job shack, etc, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
3. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Project Manager schedules Substantial Completion inspection. Remove before Substantial Completion.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas within construction limits indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and nontracking. Reapply treatment as required to minimize dust.

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 312000 "Earth Moving."

3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
- D. Traffic Controls: Comply with requirements of authorities having jurisdiction.
1. Protect existing site improvements to remain.
 2. Maintain access for fire-fighting equipment.
- E. Parking: Provide temporary parking areas for construction personnel.
- F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- G. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.
- H. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 017300 "Execution."
- J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Temporary Erosion and Sedimentation Control: Comply with requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and requirements specified in Section 311000 "Site Clearing."
- D. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- E. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- F. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- G. Tree and Plant Protection: Install temporary fencing located outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.
- H. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- I. Site Enclosure Fence: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations and as indicated on Drawings.
 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Project Manager.
- J. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.
- K. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- L. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- M. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.
- 3.5 OPERATION, TERMINATION, AND REMOVAL
- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean

exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015720 - ENVIRONMENTAL PROTECTION MEASURES/BEST MANAGEMENT
PRACTICES

PART 1 - GENERAL

- A. The following Environmental Protection Measures/BMPs (listed by resource area) would be implemented to ensure that impacts are less than significant.

1.2 RELATED DOCUMENTS

- A. A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

- A. Related Sections
 - 1. Division 01 Section "Construction Waste Management and Disposal" for Coordination of Waste Management.

1.4 AIR QUALITY

- A. Implement the following dust control measures during all phases of demolition and construction:
 - 1. Water exposed soils twice per day;
 - 2. Tarp all soil stockpiles when not in use;
 - 3. Apply soil stabilizers to exposed soil;
 - 4. Maintain all construction equipment in proper condition to ensure that vehicle emissions do not exceed allowable levels; and
 - 5. Park all construction equipment on-site for the duration of construction activities.
 - 6. In addition, prior to initiating demolition activities:
 - a. Conduct survey to determine the presence of asbestos-containing materials or lead-based paint;
 - b. If either material is present, all demolition activities shall be conducted in accordance with local, state, and Federal rules regarding asbestos and lead-based paint abatement and removal.

1.5 NOISE

- A. Implement the following noise control measure during all phases of demolition and construction:
 - 1. Fit all construction equipment with factory installed muffling devices and maintain all equipment in good working order;
 - 2. Restrict hours of construction to 7AM to 5PM, Monday through Friday; unless otherwise approved by the Project Manager.

3. Restrict truck trips to 8AM to 4PM, Monday through Friday; unless otherwise approved by the Project Manager, and
4. Ensure no demolition activities occur during the nighttime, on weekends, or Federal holidays.

1.6 GEOLOGY AND SOILS

- A. Implement Environmental Protection Measures described for air quality maintenance in addition to the following measures:
 1. Prepare an Erosion and Sediment Control Plan in which erosion control, spill prevention, and post-construction BMPs would be specified; and
 2. Construct buildings in accordance with the Hawaii State Building Code.

1.7 WATER RESOURCES

- A. Implement the following measures prior to implementation of construction activities:
 1. Implement the Stormwater Pollution Prevention Plan (SWPPP) as part of the National Pollutant Discharge Elimination System (NPDES) permit conditions as specified by the Hawaii State Department of Health DEQ and the U.S. Environmental Protection Agency (USEPA). SWPP and NPDES have been prepared and obtained by the Government and will be made available to the Contractor with notice to proceed.
 2. Install drains, as necessary, to intercept and discharge groundwater; and
 3. Dewater during construction, as necessary, to minimize and manage local seepage into excavated areas.
 4. Prior to any dewatering activities, consult with authorities having jurisdiction to ensure that the discharge would be covered under the existing Base NPDES discharge permit; if not, obtain the appropriate discharge permit and water quality certification as required.

1.8 BIOLOGICAL RESOURCES

- A. Implement the following measure:
 1. Prior to demolition activities, a survey shall be conducted by a qualified biologist for endangered or protected birds, mammals, and insects within structures proposed for demolition and adjacent shrubbery.

1.9 CULTURAL RESOURCES

- A. Implement the following measures:
 1. Construction staff shall be briefed on procedures for handling the unexpected discovery of archaeological resources and human remains prior to undertaking project

activities. All work shall be performed in accordance with the State of Hawaii Rules and Regulations.

2. In the event that cultural resources are encountered within the project area during ground-disturbing activities, all work in the area of the find would stop until a qualified archaeologist had documented and evaluated the resource for eligibility for the National Register of Historic Places (NRHP), in compliance with Section 106 of the NHPA.
3. In the event that human remains are discovered, all work in the area will stop and the Contractor shall immediately comply with the rules of practice and procedure relating to burial sites and human remains, State of Hawaii administrative rules, title 13, subtitle 13, chapter 300..

1.10 HAZARDOUS MATERIALS

A. Implement the following measures:

1. To reduce the potential contamination of groundwater, the contractor shall observe exposed soil for visual and/or olfactory evidence of petroleum during excavation activities. If potential contamination is observed, the contractor shall comply with all Federal, state, and local regulations;
2. All fill and debris associated with hazardous materials or wastes shall be characterized and disposed of according to Federal, state and local regulations; and
3. Prepare and implement a Spill Prevention, Control, and Containment Plan (SPCCP) as specified by Army Regulations.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 015720

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or

installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor Project Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Form of Approval: As specified in Section 013300 "Submittal Procedures."

b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
5. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Engineer will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.

4. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Engineer's sample", provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- 2.2 COMPARABLE PRODUCTS
- A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant

qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.

3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the work.

- B. Related Requirements:

1. Section 011000 "Summary" for limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.2 INFORMATIONAL SUBMITTALS

- A. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.
- B. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- C. Certified Surveys: Submit two copies signed by land surveyor.
- D. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project

is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Engineer for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. actual locations of connections before equipment and fixture installation.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: There is no known utility infrastructure within the project area.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Engineer and Project Manager promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 2. Establish limits on use of Project site.
 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 4. Inform installers of lines and levels to which they must comply.
 5. Check the location, level and plumb, of every major element as the Work progresses.

6. Notify Engineer and Project Manager when deviations from required lines and levels exceed allowable tolerances.
 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, grading, fill and topsoil placement.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, and column grids. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Engineer and Project Manager.

3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
1. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Project Manager.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Proceed with patching after construction operations requiring cutting are complete.
- G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as

practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials into waterways.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
- B. Related Requirements:
 - 1. Section 024116 "Structure Demolition" for disposition of waste resulting from demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
 - 2. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements, and for disposition of hazardous waste.
 - 3. Section 311000 "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Facilitate recycling and salvage of materials.

1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within **30** days of date established for the Notice to Proceed.

1.5 INFORMATIONAL SUBMITTALS

- A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
 - 1. Material category.
 - 2. Generation point of waste.
 - 3. Total quantity of waste in **tons**.
 - 4. Quantity of waste salvaged, both estimated and actual in **tons**.
 - 5. Quantity of waste recycled, both estimated and actual in **tons**.
 - 6. Total quantity of waste recovered (salvaged plus recycled) in **tons**.
 - 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- B. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- C. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- D. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- E. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

- F. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Qualification Data: For waste management coordinator.

1.6 QUALITY ASSURANCE

- A. Waste Management Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.7 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
 - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

D. Solid Waste Reporting requirements are as follows:

1. Submit solid waste reports to HIARNG, Environmental Branch for the duration of the project. The reports shall address:
 - a. Diverted Waste (i.e. waste that does not go into the landfill)
 - b. Recycled Waste
 - c. Landfill Waste
 - d. Recovered Waste (i.e. freon from AC equipment and refrigerator).
2. Submit legible copies of dump ticket receipt from vendor, showing the tonnage of waste. If waste products are combined together with other projects, the contractor shall provide a breakdown per project.

E. Submit solid waste reports for the duration of the project. The reports shall address:

1. Diverted Waste (i.e. waste that does not go into the landfill)
2. Recycled Waste
3. Landfill Waste
4. Recovered Waste (i.e. Freon from AC equipment and refrigerator).

F. Submit legible copies of dump ticket receipt from vendor, showing the tonnage of waste. If waste products are combined together with other projects, the contractor shall provide a breakdown per project.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

- B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.
- C. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to everyone concerned within three days of submittal return.
 - 2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- D. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

- A. Salvaged Items for Reuse in the Work:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until installation.
 - 4. Protect items from damage during transport and storage.
 - 5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.
- B. Salvaged Items for Sale and Donation: Not permitted on Project site.
- C. Salvaged Items for Owner's Use:
 - 1. Clean salvaged items.
 - 2. Pack or crate items after cleaning. Identify contents of containers.
 - 3. Store items in a secure area until delivery to Government.
 - 4. Transport items to Government's storage area designated by Government.

5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Recycling Receivers and Processors: Use locally available recycling receivers and processors.
- C. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Government.
- D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
 4. Store components off the ground and protect from the weather.
 5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.
 1. Pulverize concrete to maximum 1-1/2-inch size.
- B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.
- C. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
 2. Remove and dispose of bolts, nuts, washers, and other rough hardware.
- D. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials and dispose of at designated spoil areas on Owner's property.

D. Disposal: Remove waste materials from Owner's property and legally dispose of them.

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

3.7 SAMPLE FORMS

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for submitting final completion construction photographic documentation.
2. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.2 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Project Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Project Manager signature for receipt of submittals.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection

for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Government of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Government. Advise Government's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Government's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
6. Advise Government of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Engineer and Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Engineer's Substantial Completion inspection list of

items to be completed or corrected (punch list), endorsed and dated by Engineer. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Government's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Engineer and Project Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.

1. Organize list of spaces in sequential order.
2. Organize items applying to each space by major element.
3. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Engineer, through Project Manager will return annotated copy.
 - b. PDF electronic file. Engineer, through Project Manager will return annotated copy.

1.8 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including

landscape development areas, of rubbish, waste material, litter, and other foreign substances.

- b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 1. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

END OF SECTION 017700

SECTION 017800 - CLOSEOUT SUBMITTALS

PART 1 - GENERAL

1.1 SUBMITTALS

A. 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 013300 SUBMITTAL PROCEDURES:

1. SD-02 Shop Drawings

a. As-Built Drawings; G

- 1) Drawings showing final as-built conditions of the project. Two sets of the approved marked working as-built prints.
- 2) One electronic copy of the As-built Drawings in AutoCAD 2013 format.

2. SD-03 Product Data

a. As-Built Record of Equipment and Materials; G

- 1) Two copies of the record listing the as-built materials and equipment incorporated into the construction of the project.

b. Warranty Management Plan; G

- 1) One set of the warranty management plan containing information relevant to the warranty of materials and equipment incorporated into the construction project, including the starting date of warranty of construction. The Contractor shall furnish with each warranty the name, address, and telephone number of each of the guarantor's representatives nearest to the project location.

c. Warranty Tags; G

- 1) Two record copies of the warranty tags showing the layout and design.

d. Final Cleaning; G

- 1) Two copies of the listing of completed final clean-up items.

1.2 PROJECT RECORD DOCUMENTS

A. As-Built Drawings: This paragraph covers as-built drawings complete, as a requirement of the contract. The terms "drawings," "contract drawings," "drawing files," "working as-built drawings" and "final as-built drawings" refer to contract drawings which are revised to be used for final as-built drawings.

1. Government Furnished Materials: One set of reproducible drawings revised to reflect all bid amendments will be provided by the Government at the preconstruction conference for projects requiring manually prepared as-built drawings.

2. Working As-Built and Final As-Built Drawings: The Contractor shall revise 1 set of paper drawings by red-line process to show the as-built conditions during the prosecution of the project. These working as-built marked drawings shall be kept current on a weekly basis and shall be available on the jobsite at all times. Changes from the contract plans which are made in the work or additional information which might be uncovered in the course of construction shall be accurately and neatly recorded as they occur by means of details and notes. The working as-built marked prints will be jointly reviewed for accuracy and completeness by the Project Manager and the Contractor prior to submission of each monthly pay estimate. If the Contractor fails to maintain the working and final as-built drawings as specified herein, the Project Manager will deduct from the monthly progress payment an amount representing the estimated cost of maintaining the as-built drawings. This monthly deduction will continue until an agreement can be reached between the Project Manager and the Contractor regarding the accuracy and completeness of updated drawings. The working and final as-built drawings shall show, but shall not be limited to, the following information:

- a. The actual location, kinds and sizes of all sub-surface utility lines. In order that the location of these lines and appurtenances may be determined in the event the surface openings or indicators become covered over or obscured, the as-built drawings shall show, by offset dimensions to two permanently fixed surface features, the end of each run including each change in direction. Appurtenances shall be located by dimensioning along the utility run from a reference

point. The average depth below the surface of each run shall also be recorded.

- b. The location and dimensions of any changes within the building structure.
- c. Correct grade, elevations, cross section, or alignment of earthwork, structures or utilities if any changes were made from contract plans.
- d. Changes in details of design or additional information obtained from working drawings specified to be prepared and/or furnished by the Contractor; including but not limited to fabrication, erection, installation plans and placing details, pipe sizes, insulation material, dimensions of equipment foundations, etc.
- e. The topography, invert elevations and grades of drainage installed or affected as part of the project construction.
- f. Changes or modifications which result from the final inspection.
- g. Where contract drawings or specifications present options, only the option selected for construction shall be shown on the final as-built prints.
- h. Modifications (change order price shall include the Contractor's cost to change working and final as-built drawings to reflect modifications) and compliance with the following procedures.
 - 1) Directions in the modification for posting descriptive changes shall be followed.
 - 2) A Modification Circle shall be placed at the location of each deletion.
 - 3) For new details or sections which are added to a drawing, a Modification Circle shall be placed by the detail or section title.
 - 4) For minor changes, a Modification Circle shall be placed by the area changed on the drawing (each location).
 - 5) For major changes to a drawing, a Modification Circle shall be placed by the title of the affected plan, section, or detail at each location.

- 6) For changes to schedules or drawings, a Modification Circle shall be placed either by the schedule heading or by the change in the schedule.
 - 7) The Modification Circle size shall be 1/2 inch diameter unless the area where the circle is to be placed is crowded. Smaller size circle shall be used for crowded areas.
3. Drawing Preparation: The as-built drawings shall be modified as may be necessary to correctly show the features of the project as it has been constructed by bringing the contract set into agreement with approved working as-built prints, and adding such additional drawings as may be necessary. These working as-built marked prints shall be neat, legible and accurate. These drawings are part of the permanent records of this project and shall be returned to the Project Manager after approval by the Government. Any drawings damaged or lost by the Contractor shall be satisfactorily replaced by the Contractor at no expense to the Government.
 4. Payment: No separate payment will be made for as-built drawings required under this contract, and all costs accrued in connection with such drawings shall be considered a subsidiary obligation of the Contractor.
- B. As-Built Record of Materials: The Contractor shall furnish two copies of preliminary record of materials used on the project 15 days prior to final inspection. This preliminary submittal will be reviewed and returned 2 days after final inspection with Government comments. Two sets of final record of materials shall be submitted 10 days after final inspection. The designations shall be keyed to the related area depicted on the contract drawings. The record shall list the following data:
- RECORD OF DESIGNATED EQUIPMENT AND MATERIALS DATA
1. Description
 2. Specification
 3. Manufacturer and Catalog
 4. Composition
 5. Where Used
 6. Section
 7. Size
 8. Model
 9. Serial Number
- C. Final Approved Shop Drawings: The Contractor shall furnish final approved project shop drawings 7 days after transfer of the completed facility.

- D. Real Property Equipment: The Contractor shall furnish a list of installed equipment furnished under this contract. The list shall include all information usually listed on manufacturer's name plate. The "EQUIPMENT-IN-PLACE LIST" shall include, as applicable, the following for each piece of equipment installed: description of item, location (by room number), model number, serial number, capacity, name and address of manufacturer, name and address of equipment supplier, condition, spare parts list, manufacturer's catalog, and warranty. The list shall be furnished 7 days after transfer of the completed facility.

1.3 WARRANTY MANAGEMENT

- A. Warranty Management Plan: The Contractor shall develop a warranty management plan which shall contain information relevant to the clause Warranty of Construction in the Contract . At least 14 days before the planned pre-warranty conference, the Contractor shall submit the warranty management plan for Government approval. The warranty management plan shall include all required actions and documents to assure that the Government receives all warranties to which it is entitled. The plan shall be in narrative form and contain sufficient detail to render it suitable for use by future maintenance and repair personnel, whether tradesmen, or of engineering background, not necessarily familiar with this contract. The term "status" as indicated below shall include due date and whether item has been submitted or was accomplished. Warranty information made available during the construction phase shall be submitted to the Project Manager for approval prior to each monthly pay estimate. Approved information shall be assembled in a binder and shall be turned over to the Government upon acceptance of the work. The construction warranty period shall begin on the date of project acceptance and shall continue for the full product warranty period. A joint 4 month and 9 month warranty inspection shall be conducted, measured from time of acceptance, by the Contractor, Project Manager and the Customer Representative. Information contained in the warranty management plan shall include, but shall not be limited to, the following:

1. Roles and responsibilities of all personnel associated with the warranty process, including points of contact and telephone numbers within the organizations of the Contractors, subcontractors, manufacturers or suppliers involved.
2. Listing and status of delivery of all Certificates of Warranty for extended warranty items.
3. A list for each warranted item, feature of construction or system indicating:

- a. Name of item.
 - b. Model and serial numbers.
 - c. Location where installed.
 - d. Name and phone numbers of manufacturers or suppliers.
 - e. Names, addresses and telephone numbers of sources of spare parts.
 - f. Warranties and terms of warranty. This shall include one-year overall warranty of construction. Items which have extended warranties shall be indicated with separate warranty expiration dates.
 - g. Cross-reference to warranty certificates as applicable.
 - h. Starting point and duration of warranty period.
 - i. Summary of maintenance procedures required to continue the warranty in force.
 - j. Cross-reference to specific pertinent Operation and Maintenance manuals.
 - k. Organization, names and phone numbers of persons to call for warranty service.
 - l. Typical response time and repair time expected for various warranted equipment.
4. The Contractor's plans for attendance at the 4 and 9 month post-construction warranty inspections conducted by the Government.
 5. Procedure and status of tagging of all equipment covered by extended warranties.
 6. Copies of instructions to be posted near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- B. Performance Bond: The Contractor's Performance Bond shall remain effective throughout the construction period.
1. In the event the Contractor fails to commence and diligently pursue any construction warranty work required, the Project Manager will have the work performed by others, and after completion of the work, will charge the remaining construction warranty funds of expenses incurred by the Government while performing the work, including, but not limited to administrative expenses.
 2. In the event sufficient funds are not available to cover the construction warranty work performed by the Government at the Contractor's expense, the Project Manager will have the right to recoup expenses from the bonding company.
 3. Following oral or written notification of required construction warranty repair work, the Contractor shall respond in a timely manner. Written verification will follow oral instructions. Failure of the Contractor to

respond will be cause for the Project Manager to proceed against the Contractor.

- C. Pre-Warranty Conference: Prior to contract completion, and at a time designated by the Project Manager, the Contractor shall meet with the Project Manager to develop a mutual understanding with respect to the requirements of this section. Communication procedures for Contractor notification of construction warranty defects, priorities with respect to the type of defect, reasonable time required for Contractor response, and other details deemed necessary by the Project Manager for the execution of the construction warranty shall be established/reviewed at this meeting. In connection with these requirements and at the time of the Contractor's quality control completion inspection, the Contractor shall furnish the name, telephone number and address of a licensed and bonded company which is authorized to initiate and pursue construction warranty work action on behalf of the Contractor. This point of contact will be located within the local service area of the warranted construction, shall be continuously available, and shall be responsive to Government inquiry on warranty work action and status. This requirement does not relieve the Contractor of any of its responsibilities in connection with other portions of this provision.
- D. Contractor's Response to Construction Warranty Service Requirements: Following oral or written notification by the Project Manager, the Contractor shall respond to construction warranty service requirements in accordance with the "Construction Warranty Service Priority List" and the three categories of priorities listed below. The Contractor shall submit a report on any warranty item that has been repaired during the warranty period. The report shall include the cause of the problem, date reported, corrective action taken, and when the repair was completed. If the Contractor does not perform the construction warranty within the timeframes specified, the Government will perform the work and backcharge the construction warranty payment item established.
1. First Priority Code 1. Perform onsite inspection to evaluate situation, and determine course of action within 4 hours, initiate work within 6 hours and work continuously to completion or relief.
 2. Second Priority Code 2. Perform onsite inspection to evaluate situation, and determine course of action within 8 hours, initiate work within 24 hours and work continuously to completion or relief.
 3. Third Priority Code 3. All other work to be initiated within 3 work days and work continuously to completion or relief.

4. The "Construction Warranty Service Priority List" is as follows:

a. Code 3-All work.

E. Warranty Tags: At the time of installation, each warranted item shall be tagged with a durable, oil and water resistant tag approved by the Project Manager. Each tag shall be attached with a copper wire and shall be sprayed with a silicone waterproof coating. The date of acceptance and the QC signature shall remain blank until project is accepted for beneficial occupancy. The tag shall show the following information.

1. Type of product/material_____.
2. Model number_____.
3. Serial number_____.
4. Contract number_____.
5. Warranty period_____ from_____ to_____.
6. Inspector's signature_____.
7. Construction Contractor_____.
 - a. Address_____.
 - b. Telephone number_____.
8. Warranty contact_____.
 - a. Address_____.
 - b. Telephone number_____.
9. Warranty response time priority code_____.

10. WARNING - PROJECT PERSONNEL TO PERFORM ONLY OPERATIONAL
MAINTENANCE DURING THE WARRANTY PERIOD.

1.4 OPERATION AND MAINTENANCE MANUALS

- A. Operation manuals and maintenance manuals shall be submitted as specified. Operation manuals and maintenance manuals provided in a common volume shall be clearly differentiated and shall be separately indexed.

1.5 FINAL CLEANING

- A. The premises shall be left clean. Stains, foreign substances, and temporary labels shall be removed from surfaces. Shall be removed from drainage systems, gutters, and downspouts. The site shall have waste, surplus materials, and rubbish removed. The project area shall have temporary structures, barricades, project signs, and construction facilities removed. A list of completed clean-up items shall be submitted on the day of final inspection.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 017800

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SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Maintenance documentation directory.
2. Emergency manuals.
3. Product maintenance manuals.
4. Equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Engineer and Project Manager will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

- B. Format: Submit operations and maintenance manuals in the following format:

1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.

- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Engineer and Project Manager will return copy with comments.

1. Correct or revise each manual to comply with Engineer's comments. Submit copies of each corrected manual within 15

days of receipt of Engineer's and Project Manager's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.
 - 3. Manual contents.
- C. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Project Manager.
 - 7. Name and contact information for Engineer.
 - 8. Names and contact information for major consultants to the Engineer that designed the systems contained in the manuals.
 - 9. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, post-type binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing

titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 - 1. Fire.
 - 2. Flood.
 - 3. Equipment failure.
 - 4. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Special instructions and procedures.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. Operating standards.
 - 2. Operating procedures.
 - 3. Operating logs.
 - 4. Piped system diagrams.
 - 5. Precautions against improper use.
 - 6. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
 2. Manufacturer's name.
 3. Complete nomenclature and number of replacement parts.
- C. the sequence of operation, and diagram controls as installed.
- D. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Product Information: Include the following, as applicable:
1. Product name and model number.
 2. Manufacturer's name.
 3. Color, pattern, and texture.
 4. Material and chemical composition.
 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
1. Inspection procedures.
 2. Types of cleaning agents to be used and methods of cleaning.
 3. List of cleaning agents and methods of cleaning detrimental to product.
 4. Schedule for routine cleaning and maintenance.
 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
- E. Maintenance and Service Schedules: Include service requirements, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Government's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- D. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

- 1) Submit one paper-copy set of marked-up record prints.
- 2) Submit PDF electronic files of scanned record prints and one set of file prints.
- 3) Submit record digital data files and one set of plots.
- 4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

- 1) Submit three paper-copy set(s) of marked-up record prints.
- 2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
- 3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

- 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit record digital data files and three set(s) of record digital data file plots.
 - 3) Plot each drawing file, whether or not changes and additional information were recorded.
- B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
 4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record

prints with Engineer and Project Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 4. Refer instances of uncertainty to Engineer and Project Manager for resolution.
 5. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Engineer and Project Manager.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.

3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file and paper copy.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file and paper copy.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file and paper copy.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Engineer and Project Manager reference during normal working hours.

END OF SECTION 017839

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SECTION 024116 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Demolition and removal site improvements.
2. Removing below-grade construction.
3. Salvaging items for reuse by Owner.

1.2 MATERIALS OWNERSHIP

A. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.3 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit informational report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection and for dust control. Indicate proposed locations and construction of barriers.

1. Adjacent Ranges: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those sites.

B. Schedule of building demolition with starting and ending dates for each activity.

C. Inventory of items to be removed and salvaged.

D. Predemolition photographs.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.
- C. Predemolition Conference: Conduct conference at a location on base approved by the Project Manager.

1.5 PROJECT CONDITIONS

- A. The Range will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent ranges.
 - 2. Maintain access to existing pathways or trails used by occupants of adjacent ranges.
 - a. Do not close or obstruct pathways and trails used by occupants of adjacent ranges without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for structures to be demolished.
 - 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 2. Before building demolition, Owner will remove the following items:
 - a. Not applicable.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Project Manager.
- E. On-site storage or sale of removed items or materials is not permitted.

- F. Arrange demolition schedule so as not to interfere with operations of adjacent ranges.

PART 2 - PRODUCTS (Not Used)

2.1 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that no utilities must be disconnected and capped before starting demolition operations.
- B. Inventory and record the condition of items to be removed and salvaged.

3.2 PREPARATION

- A. Existing Utilities: There are no known utilities within the project site.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
- C. Salvaged Items:
 - 1. There are no items to be salvaged.

3.3 PROTECTION

- A. Existing Facilities: Protect adjacent pathways and trails.
- B. Existing Utilities: Maintain utility services to remain and protect from damage during demolition operations. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
- C. Temporary Protection: Erect temporary protection, such as trails and fences, where required by authorities having jurisdiction

and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."

1. Protect adjacent facilities from damage due to demolition activities.
 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 4. Provide temporary barricades and other protection required to prevent injury to people and damage to facilities to remain.
 5. Provide protection to ensure safe passage of people around demolition area and to and from ranges.
- D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 DEMOLITION

- A. General: Demolish indicated site improvements completely. Use methods required to complete the Work within limitations of governing regulations.
1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least 6 hours after flame cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
- B. Site Access and Temporary Controls: Conduct demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
1. Do not close or obstruct paths, trails, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.
- C. Explosives: Use of explosives is not permitted.

- D. Proceed with demolition of structural framing members systematically, 1.
- E. Salvage: Items to be removed and salvaged are indicated on Drawings.
- F. Demolish foundation and other below-grade construction within footprint of new construction and extending **5 feet** outside footprint indicated for new construction.
 - 1. Remove below-grade construction, footings, completely.
- G. Existing Utilities: No utilities are known to exist within the project area.
- H. Below-Grade Areas: Completely fill below-grade areas and voids resulting from building demolition operations with satisfactory soil materials according to backfill requirements in Section 312000 "Earth Moving."
- I. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.
- J. Promptly repair damage to adjacent ranges caused by demolition operations.

3.5 CLEANING

- A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. See Section 017419 "Construction Waste Management and Disposal" for recycling and disposal of demolition waste.
- B. Do not burn demolished materials.
- C. Clean adjacent improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before demolition operations began.

END OF SECTION 024116

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SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement.

1.3 INFORMATIONAL SUBMITTALS

- A. Material certificates.
- B. Material test reports.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- B. Testing Agency Qualifications: An independent agency, acceptable to Project Manager, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

- D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- E. Preinstallation Conference: Conduct conference at a location on base suitable to the Project Manager.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
- B. Normal-Weight Aggregates: ASTM C 33, graded.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable. Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali.

2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Water: Potable.

2.6 CONCRETE MIXTURES

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
- B. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, and concrete with a water-cementitious materials ratio below 0.50.
- C. Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50.
3. Slump

Structural Element	Slump	
	Minimum	Maximum
Walls, columns and beams	2 in .	4 in.
Foundation walls, sub-structure walls, footings, slabs	2 in.	4 in.
Any structural concrete approved for placement by pumping:		
At Pump	2 in.	6 in.
At discharge of line	2 in.	4 in.

When use of a plasticizing admixture conforming to ASTM C 1017 or when a Type F or G high range water reducing admixture conforming to ASTM C 393 is permitted to increase the slump of concrete, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 8 inches at the point of delivery after the admixture is added. When using a mid-range water reducing admixture conforming to ASTM C 494, Type A or F, concrete shall have a slump of 2 to 4 inches before the admixture is added and a maximum slump of 6 inches at the point of delivery after the admixture is added.

4. Air Content: 3 percent, plus or minus 1.5 percent at point of delivery for 1-inch nominal maximum aggregate size.
5. Water - cementitious ratio and air content requirement has been waived for 3000 psi concrete where used for non-structural applications, such as filling bollards and post footings.

2.7 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Preparation of structural footings. Surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semidetached or unsound fragments. Refer to section 312000 - EARTH MOVING, Part 3.3 "Excavation for Structures" and Appendix 1 Geotechnical Report.
- C. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- D. Chamfer exterior corners and edges of permanently exposed concrete.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Project Manager.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
- C. Cold-Weather Placement: Comply with ACI 306.1.
- D. Hot-Weather Placement: Comply with ACI 301.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by forming material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days.

3.8 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Project Manager. Remove and replace concrete that cannot be repaired and patched to Project Manager's approval.

3.9 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

END OF SECTION 033000

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.
2. Armor Steel Plate.
3. Grout.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Armor Steel Plate: Elements of the overhead ballistic baffle system Round Defeating Substrate indicated on the Drawings, identified as AR500 Steel Plate, and described in Section 2.2.E: Armor Steel Plate below.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at a location on base suitable to the Project Manager.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 2. Include embedment drawings.
 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and high-strength bolted connections.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, fabricator, and testing agency.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel and armor steel plate, including chemical and physical properties.
- E. Source quality-control reports.
- F. Field quality-control and special inspection reports.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 360.
 - 3. AISC 341
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.
 1. Select and complete connections using schematic details indicated and AISC 360 and 341.
 2. Use Allowable Stress Design; data are given at service-load level.
- B. Moment Connections: Type FR, fully restrained.

2.2 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M.

- B. Channels, Angles: ASTM A 36/A 36M.
- C. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- D. Unheaded Anchor Rods: ASTM F 1554, Grade 36, Grade 105.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- E. Plate and Bar: ASTM A 36/A 36M.
- F. Armor Steel Plate: AR500 Steel Plate consisting of "through hardened", abrasion resistant armor steel with 500 Brinell Hardness Number (BHN) and a minimum thickness as specified on the Drawings. Nominal AR500 ballistic plate manufactured to BHN 500 may have BHN values ranging from 480 to 530. Approved providers are:
 - 1. Chapel Steel - Spring House, PA
 - 2. Benco Steel - Hickory, NC
 - 3. Other vendors may be used upon approval of Project Manager.
- G. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade B, structural tubing.
- H. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
- I. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
- B. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain.
- C. Galvanizing Repair Paint: SSPC-Paint 20.
- D. Threaded Rods: ASTM A 36/A 36M.

1. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.4 PRIMER

- A. Primer: Comply with Section 099113 "Exterior Painting".

2.5 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 1, "Solvent Cleaning."

- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.

3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.

2.7 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Pretensioned, Class A faying surface per AISC 341, except as noted.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

Contractor shall select welding materials and procedures used for welding AR500 steel plate to minimize loss of material hardness. Submit welding procedure to Contract Officer.

2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 2. Surfaces to be field welded.
 3. Surfaces of high-strength bolted, slip-critical connections.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 1. SSPC-SP 2, "Hand Tool Cleaning."
 2. SSPC-SP 3, "Power Tool Cleaning."
 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of

1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Baseplates: Clean concrete bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- I. Construct AR500 Steel Ballistic Baffle Plates with attention to the quality of the fabricated parts. Baffle plates with butt joints must fit together closely to prevent any gaps and must be

fabricated/erected using AR500 steel joint-closure/backer plates as shown in the Drawings.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned Class A faying surface per AISC 341, except as noted.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Contractor shall select welding materials and procedures used for welding AR500 steel plate to minimize loss of material hardness. Submit welding procedure to Project Manager.
 - 3. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 4. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector, acceptable to Project Manager and structural engineer of record, to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Metal bollards.
 - 2. Pipe Downspouts.

1.2 ACTION SUBMITTALS

- A. Product Data: For the following:

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Pipe: ASTM A 53/A 53M.

2.3 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.
- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- G. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Use connections that maintain structural value of joined pieces.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- D. Where units are indicated to be cast into concrete, equip with integrally welded steel strap anchors not less than 8 inches from ends and corners of units and 24 inches o.c.

2.5 METAL BOLLARDS

- A. Fabricate metal bollards from steel pipe, as indicated.
- B. Prime bollards with zinc-rich primer.

2.6 DOWNSPOUTS

- A. Fabricate downspouts from 4 inch diameter, 26 gauge, galvanized steel. Include fittings and supports required to run from the gutter to the PVC drain at the column footing. Insert downspout a minimum of 6 inches into the PVC drain leader.

2.7 Fabricate gutters from ¼" thick, Grade A36 steel. Attach to AR500 steel plate by welding. Select welding procedure and materials that will minimize loss of hardness to AR500 plate. Submit welding procedure to Contract Officer. Paint gutter to match structural steel. See Section 099113 - Exterior Painting.

2.8 STEEL AND IRON FINISHES

A. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer indicated.

B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning." Or SSPC-SP 3, "Power Tool Cleaning." requirements indicated below:

C. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, or similar construction.

3.2 INSTALLING METAL BOLLARDS AND NON-STRUCTURAL FOOTINGS

A. Anchor bollards and non-structural items in place with concrete footings. Place concrete and vibrate or tamp for consolidation. Support and brace in position until concrete has cured.

B. Fill bollards solidly with concrete, mounding top surface to shed water.

END OF SECTION 055000

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on exterior substrates.
 - 1. Steel.
- B. Provide paint finish for all exposed steel.
- C. Related requirements: Section 051200 "Structural Steel Framing" for shop painting of metal substrates with primers specified in this section.

1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit samples on rigid backing, 5 inches square.

- C. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

- 1. Final approval of color selections will be based on mockups.

- a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Project Manager at no added cost to Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- 1. Benjamin Moore & Co.
 - 2. Kelly-Moore Paints.
 - 3. Pratt & Lambert/
 - 4. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List", except as noted.

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

D. Colors:

1. Roof Panels Sherwin-Williams Extra-White SW7006 or matching color as approved by the Project Manager.
2. Columns Safety yellow as approved by Project Manager.
3. Provide primer and top coat compatible with ballistic rubber. Match color to the satisfaction of the Project Manager.

2.3 PRIMERS

- A. Primer, B58-600 series, Macropoxy 646 fast cure epoxy coating, MPI #108.

2.4 SOLVENT-BASED PAINTS

- A. Intermediate Coat: B65-600/650 series, Acrolon 218H5, MPI #72
- B. Top Coat: B65-500 series Fluorokem, or as approved.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
 - 2. Where ballistic rubber is applied, apply primer coat only.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Project Manager, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - a. Primer: B65-600 series, Macropoxy 646 fast cure epoxy coating. MPI #108.
 - b. Intermediate Coat: B65-600/650 series, Acrolon 218HS - MPI #72.
 - c. Top Coat: B65-500 series Fluorokem Coating, or as approved by Project Manager.
- B. Ballistic rubber: Primer and topcoat compatible with ballistic rubber.

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

END OF SECTION 099113

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Panel signs.
2. Training Buildings:
 - a. Provide one 16"w x 8"h range sign for side wall nearest range entrance. Owner to provide information to be incorporated onto sign face.

1.2 DEFINITIONS

A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
- C. Samples: For each sign type and for each color and texture required.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum Castings: ASTM B 26/B 26M, of alloy and temper recommended by sign manufacturer for casting process used and for use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
- C. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 6063-T5.
- D. Brass Castings: ASTM B 584, Alloy UNS No. C85200 (high-copper yellow brass).
- E. Brass, Yellow, Sheet: ASTM B 36/B 36M, Alloy UNS No. C26000.
- F. Bronze Castings: ASTM B 584, Alloy UNS No. C86500 (No. 1 manganese bronze).
- G. Bronze Plate: ASTM B 36/B 36M.
- H. Copper Sheet: ASTM B 152/B 152M.
- I. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
- J. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing, suitable for exterior applications.

2.2 PANEL SIGNS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ACE Sign Systems, Inc.
 - 2. Advance Corporation; Braille-Tac Division.
 - 3. Allen Industries Architectural Signage
 - 4. Allenite Signs; Allen Marking Products, Inc.
 - 5. APCO Graphics, Inc.
 - 6. ASI-Modulex, Inc.
 - 7. Best Sign Systems Inc.
 - 8. Bunting Graphics, Inc.
 - 9. Fossil Industries, Inc.

10. Gemini Incorporated.
11. Grimco, Inc.
12. Innerface Sign Systems, Inc.
13. InPro Corporation
14. Matthews International Corporation; Bronze Division.
15. Mills Manufacturing Company.
16. Mohawk Sign Systems.
17. Nelson-Harkins Industries.
18. Seton Identification Products.
19. Signature Signs, Incorporated.
20. Supersine Company (The)
21. Or approved equal

B. Exterior Panel Signs: Provide smooth sign panel surfaces constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally from corner to corner, complying with the following requirements:

1. Aluminum Sheet: 0.080 inch thick.
2. Edge Condition: Bullnose.
3. Corner Condition: Square.
4. Mounting: Unframed.
 - a. Manufacturer's standard noncorroding anchors for substrates encountered.
5. Color: As selected by Project Manager in accordance with base standards and from manufacturer's full range.

C. Exterior Range Identification Sign

1. Plaque Material
 - a. Shall be made of 0.090 inch thick sheet aluminum or steel and shall be mounted on anodized bronze extruded aluminum posts set in concrete.
2. Posts
 - a. Height
 - 1) 6 feet 0 inches.
 - b. Thickness
 - 1) Shall have minimum 1/8 inch wall thickness, designed to accept sign panel as described, no exposed fasteners, caps shall be provided for each post made of the same material and color as the post.
3. Lettering

- a. Shall be white on a brown background.
4. Plaque Dimensions
 - a. Height shall be 2 feet 6 inches. Width shall be 3 feet 8 inches.
 5. Message Lines
 - a. Shall be upper and lower case Helvetica medium, 3 inch capital letter height, flush left, 3 lines total.
 6. Address Line
 - a. Shall be upper and lower case Helvetica medium, 4 inch numbers, flush left.
 7. Rules
 - a. Rules shall be 1/8 inch wide white tape.
 8. Graphics
 - a. Shall appear on both sides of the plaque as they are placed perpendicular to the roadway.
 9. Message Content
 - a. Shall be provided by the Government prior to submittal. Contractor shall request this information via an RFI to the Government.
 10. Additional Information
 - a. See the drawings for additional information.
- D. Brackets: Fabricate brackets and fittings for bracket-mounted signs from extruded aluminum to suit panel sign construction and mounting conditions indicated. Factory paint brackets in color matching background color of panel sign.
- E. Tactile and Braille Sign: Manufacturer's standard process for producing text and symbols complying with ADA-ABA Accessibility Guidelines and with ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square-cut edges free from burrs and cut marks; Braille dots with domed or rounded shape.
1. Panel Material: Opaque acrylic sheet.
 2. Raised-Copy Thickness: Not less than 1/32 inch.

F. Applied Vinyl: Die-cut characters from vinyl film of nominal thickness of 3 mils with pressure-sensitive adhesive backing. Apply copy to exposed face of panel surfaces.

1. Panel Material: Opaque acrylic sheet.

2.3 ACCESSORIES

A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.4 FABRICATION

A. General: Provide manufacturer's standard signs of configurations indicated.

1. Welded Connections: Comply with AWS standards for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side. Clean exposed welded surfaces of welding flux and dress exposed and contact surfaces.
2. Mill joints to tight, hairline fit. Form joints exposed to weather to exclude water penetration.
3. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.5 ALUMINUM FINISHES

A. Color Anodic Finish: Manufacturer's standard Class 1 integrally colored or electrolytically deposited color anodic coating, 0.018 mm or thicker, in medium bronze applied over a polished (buffed) mechanical finish, complying with AAMA 611.

2.6 ACRYLIC SHEET FINISHES

A. Colored Coatings for Acrylic Sheet: For copy colors, provide colored coatings, including inks, dyes, and paints, that are recommended by acrylic manufacturers for optimum adherence to acrylic surface and that are UV and water resistant for five years for application intended.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.

- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

END OF SECTION 101400

SECTION 114860 - BALLISTIC RUBBER MATERIALS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Requirements for Anti-Splatter/Bullet Encapsulating Ballistic Rubber Material for the following Baffled Range components:
 - a. Overhead Ballistic Baffles as specified on the plans.
 - b. Leading Face and both Sides of all Columns and exposed concrete Pedestals and Footings forward of Column Grid A as shown on the plans.
 - c. Any other downrange structural component exposed to direct fire other than the reinforced concrete Containment Walls.

1.2 DEFINITIONS

- A. Not Used

1.3 REFERENCES

- A. 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.

1.4 SECTION REQUIREMENTS

- A. Comply with the following general criteria:

1. NRA Range Source Book current edition.
2. OSHA sound abatement or protection guidelines for shooting ranges.
3. Section (051200) Structural Steel Framing where support systems are required (baffles, etc.).
4. Ballistic Baffles to meet NIJ Level III ballistic requirements.

1.5 SUBMITTALS

A. Preconstruction Submittals:

1. List of no less than five projects of a similar scope, include client contacts for reference.
2. Installer Qualifications:
 - a. Certified by manufacturer in writing.
 - b. On-site technical support.

B. Shop Drawings:

1. Shop drawings indicating location, size and manner of fastening including items related to Section (051200) - Structural Steel Framing.

C. Product Data:

1. Manufacturer product cut sheets.

D. Test Reports:

1. NRC test results.
2. Studies and/or tests indicating round defeating performance.
3. Studies and/or tests indicating lead encapsulation.
4. US Army Research Test Summary Report of Penetration and Ricochet Evaluation for the specific system to be used. Alternate evaluation procedures may be submitted upon approval of the Project Manager.

E. Manufacturer's Instructions:

1. Installation instructions.
2. Warranty statement and terms.
3. Maintenance, lead abatement, recycling and replacement data.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Ballistic Rubber Panels: Full-size tiles equal to 5 percent of quantity installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Basis-of-Design Product: The intent of this specification is to allow for flexibility in the use of any number of Ballistic Rubber Materials available on the market and allow for the use of vulcanized and non-vulcanized ballistic rubber in the Ballistic Baffle System. Subject to compliance with requirement, provide Range Systems Dura-Panel Ballistic Rubber material, Meggitt Training Systems Vulcanized Ballistic Rubber material or comparable product by one of the following. Values in sub-paragraph below vary with manufacturer and model.

1. Range Systems; 888-999-1217
2. Action Target Inc.; 800-377-8096
3. Advanced Training Systems; 651-429-8091
4. Meggitt Training Systems; 800-813-9046
5. Other approved vendor with equivalent products.

B. Materials shall conform to the following requirements.

2.2 BALLISTIC RUBBER MATERIAL REQUIREMENTS

A. All proposed Material Product, Instructions, Warranty and Maintenance Data for the ballistic rubber materials must comply with the following general criteria:

1. Ballistic material shall be non-ricochet and non-splatter, round defeating, bullet encapsulating ballistic rubber systems.
2. Ballistic material must have been formally tested by an approved agency or facility for penetrations and ricochet values.
3. Ballistic material used must have a history of a minimum of ten (10) successful installations.
4. Ballistic material shall have self-healing properties up to round saturation guidelines.
5. Ballistic rubber material must have a minimum density of 48 lbs per cubic foot.
6. Ballistic materials must accept a latex base acrylic paint finish on their surface if required.
7. Ballistic materials, if required to meet fire resistant criteria, must have passed the Underwriters Laboratories UL 94 Horizontal Flammability Test.
8. Ballistic material must be usable in both protected and unprotected environments and provide for UV protection if used unprotected.
9. Ballistic materials must be modular, dimensionally stable, recyclable and replaceable by end user maintenance personnel.

10. Ballistic materials shall have no sand/rock filled gaps as part of the bullet capturing system.
11. Ballistic materials may be bonded directly to steel panel substrate or mechanically attached to AR500 steel panel substrate with a minimal air gap ($\frac{1}{2}$ inch) to allow for bullet capture and collection.
12. Ballistic materials shall have a minimum of a one-year warranty on manufacturing defects.
13. Ballistic rubber may be manufactured of vulcanized and/or non-vulcanized rubber provided the rubber meets all other requirements listed above.
14. Ballistic Panels must be fabricated so as to not create butt joints or gaps between panels and must overlap (lap joints) a minimum of $\frac{1}{2}$ of the panel thickness at joints.
15. In the case of mechanically attached panels, the ballistic rubber panels will: be designed to permit removal and installation in the field using common hand tools; contain bullets and fragments in the airspace without creating bulges/bellies in the wall face; permit bullets and fragments to fall to the bottom of baffle panel via gravity; and permit periodic bullet and fragment removal for recycling via access panel sections.

B. Surface Product Composition:

1. Product Data of ballistic rubber materials shall be a mixture of modified, high density composite rubber based particles, Kevlar and titanium particles, and bonding agents, molded under high pressure to form dimensionally stable ballistic panels and blocks; or be comprised of dense vulcanized rubber.
2. Ballistic rubber material is to be free of cracks, tears, holes and defects which would impair performance.
3. All ballistic rubber material will be free of metal debris.
4. Minor cracks and chipping as a result of manufacture, shipping and handling are not considered grounds for rejection.
5. Weight: 48 pounds per cubic foot, maximum
6. Compression: 3,000 psi, minimum
7. Dimensional Tolerance: $\frac{1}{4}$ " length and width; $\frac{1}{4}$ " depth.

2.3 ADDITIONAL COMPONENTS

A. Round Defeating Substrate:

1. Round Defeating Substrate:

- a. Ballistic Baffles - Hardened abrasion resistant armor steel, $\frac{1}{2}$ " minimum thickness with 500 Brinell

hardness. Refer to Section 051200: Structural Steel for Round Defeating Substrate requirements.

- b. Ballistic Side Walls - Reinforced concrete a minimum of 12-inches thick.

B. Support Systems:

1. Metal and mechanical support systems for anchoring and compression (where required) of products.

2.4 PRODUCT DESCRIPTION

A. Non-Vulcanized Ballistic Rubber Materials: Range Systems Dura-Panel™ Ballistic Rubber Encapsulating System or equal:

1. 24"w x 24"h x 2"d.
2. 35 pounds per panel.
3. UV inhibitor for all units.
4. Lap Joints ½ of panel thickness at joints.

B. Vulcanized Ballistic Rubber Materials: Meggitt Training Systems Vulcanized Ballistic Rubber System or equal:

1. 24"w x 24"h x 1-5/8"d
2. 46-50 pounds per panel
3. 100% Waterproof and UV Resistant
4. Lap Joints ½ of panel thickness at joints.

2.5 PRODUCT PERFORMANCE

A. Ballistic Rubber System

1. Must show product is successfully installed in a minimum of ten (10) existing military installations as the main bullet stopping/absorbing wall system.
2. US Army study (Picatinny Arsenal) showing that the Ballistic Rubber Material, in conjunction with the AR steel substrate component specified in Section 051200, is capable of minimal ricochet at limited incidence of angle with specific use of 7.62mm (M80 Ball), 5.56mm (M855 Ball, M855A1 EPR, M193 Ball) from M14 rifle, M16A2 and M16A1 rifle, M4A1 Carbine, M249 SAW, and M240B MG.
3. US Test Lab study (Wichita, KS) showing bullet stopping power to 2,300 fps muzzle velocity on a 300 grain bullet striking with 3,700 foot-pounds of energy.
4. Encapsulates standard, armor piercing and non-armor piercing, handgun and frangible rounds with appropriate armor backing.

5. Ballistic rubber surface is self-healing to 2,500 rounds distributed uniformly over the panel surface area without eroding, deteriorating, or significantly distorting the surface.
6. Ballistic rubber surface facing can be replaced.
7. Ballistic Rubber passes the environmental durability freeze-thaw test in accordance with Section 8 of ASTM: C67-09. Results for Weight Loss shall be less than 0.5%.
8. Ballistic rubber material shall provide a One year warranty from manufacturing defects.
9. Ballistic rubber material will accept a paint finish.
10. Ballistic rubber material test reports shall be approved through the Research and Development unit for Materials/Equipment for the US Army, Combat Applications Group, Fort Bragg, NC.
11. Ballistic rubber material testing for outdoor levels of lead dust and fume shall be less than the OSHA PEL's and the ACGIH TLV's.
12. Ballistic Rubber Panels shall utilize lap joints or other approved methods for ensuring that there are no exposed gaps between rubber panels. The issue of potential ricochet at the joints must be addressed by the manufacturer or Contractor.

PART 3 - EXECUTION

1.1 INSTALLATION

1. Comply with NRA Range Source Book, current edition, for projectile containment.
2. Comply with manufacturer's instructions for installation of system as applicable to each type of product indicated.
3. See Section (051200) Structural Steel Framing for ballistic steel support systems where applicable.
4. Provide list of subcontractor's contacts and references of no less than five (5) projects of a similar scope, including client contacts for reference.
5. Install items at locations indicated, according to the manufacturer's instructions.
6. Shop Drawings must be provided indicating locations, size and manner of fastening including all items related to Section (051200) Structural Steel Framing.
7. The Contractor is responsible for all measurements and shall field verify all measurements prior to fabrication. Bring any discrepancies to the attention of the Owner and Project Manager for resolution.
8. Exposed fastenings shall be compatible materials, shall generally match in color and finish and shall harmonize with the materials to which fastenings are applied.

9. Materials and parts necessary to complete each item, even though such work is not definitely shown or specified, shall be included.
10. Poor matching of holes for fasteners shall be cause for rejection of work.
11. Provide concealed fastenings where practicable.

1.2 SCOPE

Furnish and install Anti-Splatter/Bullet Encapsulating Ballistic Rubber Material as indicated on the plans.

END OF SECTION 114860

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SECTION 311000 - SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Protecting existing vegetation to remain.
2. Removing existing vegetation.
3. Clearing and grubbing.
4. Stripping and stockpiling topsoil.
5. Removing above- and below-grade site improvements.
6. Temporary erosion- and sedimentation-control measures.

1.2 MATERIAL OWNERSHIP

- A. Except for stripped topsoil and other materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.3 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining trails, and other adjacent occupied or used facilities during site-clearing operations.
1. Do not close or obstruct trails, or other adjacent occupied or used facilities without permission from Project Manager and authorities having jurisdiction.
 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing as a precautionary measure. There are no known utilities in the area however.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 312000 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. General: Protect trees and plants remaining on-site according to requirements in Section 015639 "Temporary Tree and Plant Protection."
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by Engineer.

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place. There are no known utilities within the project area. Contractor shall take all steps necessary to insure himself that no utilities exist in the project area.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: In the event an unknown utility is encountered:
 - 1. Notify the Project Manager immediately.
 - 2. Do not proceed with utility interruptions without Project Manager written permission.
- C. Removal of underground utilities is included in earthwork sections and with applicable fire suppression, plumbing, HVAC, electrical, communications, electronic safety and security and utilities sections and Section 024116 "Structure Demolition" and Section 024119 "Selective Demolition."

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 2. Use only hand methods for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches, and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 3 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain

surface water. Cover to prevent windblown dust and erosion by water.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.

END OF SECTION 311000

SECTION 311001 - PROJECT SOILS REPORT AND LOGS

PART 1 - GENERAL

1.1 GEOTECHNICAL ENGINEERING REPORT

- A. Masa Fujioka & Associates (MFA), Environmental - Geotechnical - Hydrogeological Engineers Geotechnical Consulting Engineers prepared the following report for SAIC, Inc of Tulsa, Oklahoma, and dated May 7, 2013. The report is included in Appendix 1 at the end of the Specifications.
- B. This report was prepared for the proposed 25M Baffled Zero Range planned at Keaukaha Military Reservation near Hilo, Hawaii, and presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations, and gravel pads for the proposed project. Please note that the information included in the Geotechnical Report is **FOR GENERAL INFORMATION ONLY**. Actual conditions in the field may vary and the Contractor shall be responsible for verification of on-site soil conditions.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 311001

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preparing subgrades for turf and grasses.
2. Excavating and backfilling for buildings and structures.
3. Excavating and backfilling for utility trenches.

1.2 DEFINITIONS

A. Backfill: Soil material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Project Manager. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Project Manager. Unauthorized excavation, as well as remedial work directed by Project Manager, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

- G. Structures: Buildings, footings, foundations, or other man-made stationary features constructed above or below the ground surface.
- H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- I. Utilities: On-site underground pipes, or conduits.

1.3 QUALITY ASSURANCE

- A. Pre-excavation Conference: Conduct conference at a location agreeable to the Project Manager.

1.4 PROJECT CONDITIONS

- A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations. This shall be completed as a precautionary measure. There are no known utilities in the project area.
- B. Do not commence earth moving operations until sediment and erosion control measures are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, Groups A-1, A-2-4, A-2-5, and A-3 according to AASHTO M 145, or a combination of these groups; free of rock or gravel larger than **3 inches** in any dimension, debris, waste, vegetation, and other deleterious matter.
 - 1. Liquid Limit: Refer to Geotechnical Report.
 - 2. Plasticity Index: Refer to Geotechnical Report.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, Groups A-2-6, A-2-7, A-4, A-5, A-6, and A-7 according to AASHTO M 145, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Backstop Select Sand Fill: Select sand fill shall consist of fine aggregate for concrete as specified in Section 703.01 of the Hawaii Department of Transportation, 2005 Standard Specifications and Special Provisions for Road and Bridge construction.
 1. Fine aggregate shall be from an approved source and shall conform to Table 703.01-1 - Physical Properties, and to the grading requirements found in Table 703.01-2, Table 703.01-3 and/or Table 703.01-4 of the HDTOT Specifications.
- G. Range Floor Select Fill: Select sand fill shall consist of fine aggregate for concrete as specified in Section 703.01 of the Hawaii Department of Transportation, 2005 Standard Specifications and Special Provisions for Road and Bridge construction.
 1. Fine aggregate shall be from an approved source and shall conform to Table 703.01-1 - Physical Properties, and to the grading requirements found in Table 703.01-2, Table 703.01-3 and/or Table 703.01-4 of the HDTOT Specifications.

2.2 ACCESSORIES

- A. None

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth moving operations.

3.2 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

3.3 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. After excavation to recommended depths, the exposed subgrade should be proof-rolled with at least 6 passes of a minimum 10-ton vibratory compactor, to check for any near-surface cavities or voids or loose areas.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.4 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.5 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls

vertically from trench bottom to **12 inches** higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: As indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. Excavate trenches **6 inches** deeper than elevation required in rock or other unyielding bearing material, **4 inches** deeper elsewhere, to allow for bedding course.

3.6 SUBGRADE INSPECTION

A. Following excavation, the exposed subgrade soils should be compacted. The surface of the excavated subgrade be compacted to 95% of maximum dry density (ASTM D-1557), and that compaction be compacted at approximately 2% above optimum moisture content.

B. Near-surface voids, soft spots, debris, or unsuitable soils revealed during the subgrade preparation should be excavated and backfilled with properly compacted structural fill.

C. Reconstruct subgrades damaged by rain, accumulated water, or construction activities, as directed by Project Manager without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of **2500 psi**, may be used when approved by Project Manager.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Project Manager.

3.8 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within **18 inches** of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 - "Cast-in-Place Concrete".
- D. Place and compact initial backfill of satisfactory soil, free of particles larger than **1 inch** in any dimension, to a height of **12 inches** over the pipe or conduit.
 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Place and compact final backfill of satisfactory soil to final subgrade elevation.

3.10 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
 1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.
 3. Under footings and foundations, use engineered fill.

3.11 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.12 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than **8 inches** in loose depth for material compacted by heavy compaction equipment, and not more than **4 inches** in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Structural fill material should be placed in 8-inch thick loose lifts, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent of maximum dry density based on ASTM D-1557.
 - 2. Under turf or unpaved areas, scarify and re-compact top **6 inches** below subgrade and compact each layer of backfill or fill soil material at 85 percent.
 - 3. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.
 - 4. Backstop Berm - Slope construction should be performed using benching at approximately 3 foot vertical height intervals, to enable compaction on flat surfaces. The existing face should be cut into benches to allow for the keying-in of the new material. Slopes should be overfilled and compacted to 90% of maximum dry density, and then graded back to the final slopes. Slopes should be constructed at a maximum slope of 2 horizontal to 1 vertical.

3.13 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Turf or Unpaved Areas: Plus or minus **1 inch**.
 - 2. Pavements: Plus or minus **1/2 inch**.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of **1/2 inch** when tested with a **10-foot** straightedge.

3.14 AGGREGATE BASE COURSE PAVEMENTS AND WALKS

- A. Place Base Course Pavements on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place Base Course pavements and walks as follows:
 - 1. Shape Base Course Pavements to required crown elevations and cross-slope grades.
 - 2. Place Base Course Pavements that exceeds **6 inches** in compacted thickness in layers of equal thickness, with no compacted layer more than **6 inches** thick or less than **3 inches** thick.
 - 3. Compact Base Course Pavements at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.15 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Project Manager.

- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.16 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

25-Meter Fully Contained SDZ Range
Keaukaha Military Reservation

CA-1410
Hawaii Army National Guard (HIARNG)

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SECTION 312319 - DEWATERING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes construction dewatering.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at a location approved by the Construction officer.

1.3 FIELD CONDITIONS

- A. Survey Work: Engage a qualified land surveyor or professional engineer to survey adjacent existing buildings, structures, and site improvements; establish exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Dewatering Performance: Design, furnish, install, test, operate, monitor, and maintain dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Provide temporary grading to facilitate dewatering and control of surface water.
- B. Protect and maintain temporary erosion and sedimentation controls, which are specified in Section 015000 "Temporary Facilities and Controls," and Section 311000 "Site Clearing," during dewatering operations.

3.2 INSTALLATION

- A. Install dewatering system complete with pump equipment, standby power and pumps, filter material gradation, valves, appurtenances, water disposal, and surface-water controls.
 - 1. Use filters or other means to prevent pumping of fine sands or silts from the subsurface.
- B. Place dewatering system into operation to lower water to specified levels before excavating below ground-water level.
- C. Provide standby equipment on-site, installed and available for immediate operation, to maintain dewatering on continuous basis if any part of system becomes inadequate or fails.

3.3 OPERATION

- A. Operate system continuously until drains, sewers, and structures have been constructed and fill materials have been placed or until dewatering is no longer required.
- B. Operate system to lower and control ground water to permit excavation, construction of structures, and placement of fill materials on dry subgrades. Drain water-bearing strata above and below bottom of foundations, drains, sewers, and other excavations.
 - 1. Do not permit open-sump pumping that leads to loss of fines, soil piping, subgrade softening, and slope instability.
 - 2. Reduce hydrostatic head in water-bearing strata below subgrade elevations of foundations, drains, sewers, and other excavations.
 - 3. Maintain piezometric water level a minimum of **24 inches** below bottom of excavation.
- C. Remove dewatering system from Project site on completion of dewatering. Plug or fill well holes with sand or cut off and cap wells a minimum of **36 inches** below overlying construction.

3.4 FIELD QUALITY CONTROL

END OF SECTION 312319

SECTION 323113 - CHAIN LINK FENCES AND GATES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes chain-link fences and swing gates.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Product Certificates: For each type of chain-link fence and gate, from manufacturer.
- D. Product Test Reports: For framing strength according to ASTM F 1043.
- E. Operation and maintenance data.
- F. Sample of special warranty.

1.3 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist.

Comply with CLFMI Product Manual and with requirements indicated below:

1. Fabric Height: As indicated on Drawings.
2. Steel Wire Fabric: As indicated on drawings.
3. Selvage: Twisted top and knuckled bottom.

2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 based on the following:

1. Fence Height: As indicated on Drawings.
2. Heavy Industrial Strength: Material Group IA, round steel pipe, Schedule 40.
 - a. Line Post: 1.9 inches in diameter.
 - b. End, Corner and Pull Post: 2.375 inches in diameter
3. Horizontal Framework Members: Intermediate top and bottom rails complying with ASTM F 1043.
4. Brace Rails: Comply with ASTM F 1043.
5. Metallic Coating for Steel Framing:
 - a. Type A zinc coating.
 - b. Type B zinc with organic overcoat.
 - c. External, Type B zinc with organic overcoat and internal, Type D zinc-pigmented coating.
 - d. Type C, Zn-5-Al-MM alloy coating.
 - e. Coatings: Any coating above.

2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177-inch-diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:

1. Type I, aluminum coated (aluminized).
2. Type II, zinc coated with minimum coating weight matching chain-link fabric coating weight.
3. Type III, Zn-5-Al-MM alloy with minimum coating weight matching chain-link fabric coating weight

2.4 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and single or double swing gate types.
 - 1. Gate Leaf Width: As indicated.
 - 2. Gate Fabric Height: As indicated.
- B. Pipe and Tubing:
 - 1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083.
 - 2. Gate Posts: Round tubular steel.
 - 3. Gate Frames and Bracing: Round tubular steel.
- C. Frame Corner Construction: Welded or assembled with corner fittings.
- D. Hardware:
 - 1. Hinges: 180-degree inward swing.
 - 2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
 - 3. Padlock and Chain: Owner furnished.
 - 4. Lock: Owner furnished.

2.5 FITTINGS

- A. General: Comply with ASTM F 626.
- B. Barbed Wire Arms: Pressed steel or cast iron or Aluminum, with clips, slots, or other means for attaching strands of barbed wire, and means for attaching to posts; for each post unless otherwise indicated, and as follows:
 - 1. Provide line posts with arms that accommodate top rail or tension wire.
 - 2. Provide corner arms at fence corner posts.
 - 3. Type I, single slanted arm.
 - 4. Type II, single vertical arm.
 - 5. Type III, V-shaped arm.
 - 6. Type IV, A-shaped arm.
- C. Finish:
 - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.
 - a. Polymer coating over metallic coating.

2. Aluminum: Mill finish.

2.6 BARBED WIRE

- A. Steel Barbed Wire: Comply with ASTM A 121, for two-strand barbed wire, 0.099-inch-diameter line wire with 0.080-inch-diameter, four-point round barbs spaced not more than 5 inches o.c.

1. Aluminum Coating: Type A.
2. Zinc Coating: Type Z, Class 3.

2.7 GROUT AND ANCHORING CEMENT

- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer, for exterior applications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance of the Work.
 1. Do not begin installation before final grading is completed unless otherwise permitted by Project Manager.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

- D. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements indicated.
- E. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- F. Post Setting: Set posts in concrete at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around posts to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend 2 inches above grade; shape and smooth to shed water.
 - b. Posts Set into Concrete in Sleeves: Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
 - c. Posts Set into Voids in Concrete: Form or core drill holes not less than 5 inches deep and 3/4 inch larger than OD of post. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
- G. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of 15 degrees or more.
- H. Line Posts: Space line posts uniformly at 10 feet o.c. maximum.
- I. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Provide horizontal tension wire at the following locations:
 - 1. Extended along top and bottom of fence fabric.
- J. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 1 inch between finish grade or surface and bottom selvage unless otherwise indicated.

- K. Barbed Wire: Install barbed wire uniformly spaced as indicated on Drawings. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.
- L. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.
- M. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.

END OF SECTION 323113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sodding.

1.2 DEFINITIONS

- A. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- B. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at a location approved by the Project Manager.

1.4 INFORMATIONAL SUBMITTALS

- A. Certification of grass sod.
 - 1. Certification of each seed mixture for turfgrass sod.
- B. Product certificates.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

2. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Lawncare Manager.
 - b. Landscape Industry Certified Lawncare Technician.
3. Pesticide Applicator: State licensed, commercial.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species:
 1. Quality: State-certified seed of grass species as listed below for solar exposure.
 2. Quality: Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 3. Full Sun: Italian rye grass- *lolium multiflorum* (temporary cover).
 4. Sun and Partial Shade:
 - a. 100% Italian rye grass (*lolium multiflorum*).
 5. Shade: Proportioned by weight as follows:
 - a. 100% Italian rye grass (*lolium multiflorum*)

2.2 TURFGRASS SOD

- A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
- B. Turfgrass Species: Sod of grass species as follows:
 - 1. Full Sun: Korean Lawn Grass - zoysia japonic.
 - 2. Shade: Korean Lawn Grass - zoysia japonic

2.3 FERTILIZERS

- A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: 2 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2.4 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

2.5 PESTICIDES

- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as

required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

PART 3 - EXECUTION

3.1 TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil.
- B. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- D. Before planting, obtain Project Manager acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.2 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 5 to 8 lb/1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas.
 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
- E. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch or planting soil within 24 hours after

completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch, and roll surface smooth.

3.3 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.4 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
- B. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings.

3.5 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with

coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.

2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

- B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

END OF SECTION 329200

SECTION 334100 - STORM UTILITY DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Channel drainage systems.
3. Encasement for piping.
4. Manholes.
5. Cleanouts.
6. Nonpressure transition couplings.
7. Stormwater inlets.
8. Pipe outlets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings:

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Show pipe sizes, locations, and elevations. Indicate interface and spatial relationship between piping, and proximate structures.
- B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F 949, PVC, pipe with bell-and-spigot ends for gasketed or glued joints.
2. Fittings: ASTM F 949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F 477, elastomeric seals.

2.2 CLEANOUTS

A. Plastic Cleanouts:

1. Description: PVC body with PVC threaded plug. Include PVC sewer pipe fitting and riser to cleanout of same material as sewer piping.

2.3 CONCRETE

A. General: Cast-in-place concrete according to ACI 318, **ACI 350/350R (ACI 350M/350RM)**, and the following:

1. Cement: ASTM C 150, Type II.
2. Fine Aggregate: ASTM C 33, sand.
3. Coarse Aggregate: ASTM C 33, crushed gravel.
4. Water: Potable.

B. Portland Cement Design Mix: **4000 psi** minimum, with 0.45 maximum water/cementitious materials ratio.

1. Reinforcing Fabric: ASTM A 185/A 185M, steel, welded wire fabric, plain.
2. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (420 MPa) deformed steel.

2.4 PIPE OUTLETS

A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.

B. Riprap Basins: Broken, irregularly sized and shaped, graded stone according to NSSGA's "Quarried Stone for Erosion and Sediment Control."

1. Average Size: NSSGA No. R-3, screen opening **2 inches**.
2. Average Size: NSSGA No. R-4, screen opening **3 inches**.
3. Average Size: NSSGA No. R-5, screen opening **5 inches**.

C. Filter Stone: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.

D. Energy Dissipaters: According to NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, **3-ton** average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install proper couplings where pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- D. Install gravity-flow, nonpressure drainage piping according to the following:
 - 1. Install piping pitched down in direction of flow.

3.3 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18" Dia X 6" outside range target area deep. Set with tops 1 inch above surrounding earth grade.
- C. Set cleanout frames and covers down range 6" below grade in PVC sleeve extending 1" above range floor.

3.4 STORMWATER OUTLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.

- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Construct energy dissipaters at outlets, as indicated.

3.5 CONCRETE PLACEMENT

- A. Place cast-in-place concrete according to ACI 318.

3.6 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Test completed piping systems according to requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Submit separate report for each test.
 - 5. Gravity-Flow Storm Drainage Piping: Test according to requirements of authorities having jurisdiction, UNI-B-6, and the following:

- a. Exception: Piping with soiltight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping according to ASTM F 1417.
 - c. Option: Test concrete piping according to **ASTM C 924**.
- C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

END OF SECTION 334100

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25M Baffled Zero Range

CA-1410

Keaukaha Military Reservation

Hawaii Army National Guard (HIARNG)

APPENDIX 1 - PROJECT SOILS REPORT AND LOGS

25M Baffled Zero Range

CA-1410

Keaukaha Military Reservation

Hawaii Army National Guard (HIARNG)

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May 7, 2013

SAIC Energy, Environment & Infrastructure, LLC (SEE&I)
9400 N. Broadway, Suite 300
Oklahoma City, OK 73114

Attn: Adam West

email: adam.b.west@saic.com

**Subject: Letter Report
Geotechnical Investigation
Proposed HIARNG Baffled Range
Keaukaha Military Reservation
Hilo, Island of Hawai'i, Hawai'i**

On January 29, 2013, Masa Fujioka and Associates (MFA) submitted a revised proposal to conduct a geotechnical investigation for the proposed construction of a new baffled range structure, a steep berm, a latrine, and driveway areas. The general location of the project is depicted on *Figure 1, Project Location Map*.

The revised proposal was based on replacing our proposed dozer-excavated test pits with borings.

We originally proposed to conduct a subsurface geotechnical investigation consisting of dozer-excavated test pits to log the subsurface, assess workability, and collect bulk samples. Investigation with test pits using construction equipment in lava rock generally provides a better assessment than other investigative methods of the hardness of anticipated basaltic rock lava flows to enable a better estimate of excavation and grading conditions for the earthwork contractor. However, that Hawaii Army National Guard (HIARNG) indicated that dozer-excavated test pits are not permissible at the project site. We subsequently provided you with three alternatives, and you selected the option that replaced the test pits with borings.

Our proposal included conducting a shear wave velocity test at the site to meet IBC 2006 requirements for site seismic class.

At this time we have completed our geological reconnaissance, boring investigation, and shear wave velocity test; collected bulk soil samples; performed laboratory testing; and prepared this letter report.

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May 7, 2013
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1.0 PROJECT CONSIDERATIONS

We understand that the proposed project consists of construction of a new baffled range facility including baffle structures, an overhead ballistic containment structure, a latrine, and driveway areas.

We understand that the baffles are light structures supported by columns, aligned in rows, with two tall concrete side walls – one on each side of the rows of baffles, in parallel. We understand that the baffle area will likely be filled 1 foot or 4 feet, depending on the design selected. We assume that fill will be imported. We understand that your intent is to have spread footings for the columns and strip footings for the concrete walls.

We understand that a section of the existing large berm will be widened approximately 3 feet at the face where the proposed baffle section abuts the berm, and a 2:1 slope constructed. We understand that on top of the berm you plan a ballistic containment structure consisting of a roof covering constructed from very heavy steel designed to keep bullets from escaping the facility, supported on a spread footing.

Basaltic lava flows are generally capable of providing capable foundation support if they are properly prepared and checked for the presence of cavities and lava tubes. Such subsurface openings, when encountered during excavation, proofrolling, or probing, require remediation through excavation and filling or through grouting.

2.0 SCOPE OF WORK

Based upon our understanding of the foregoing, and geological and geotechnical considerations, the following Scope of Work was proposed and performed:

1. *Review of Site geology and soil conditions:* Our Principal Engineer and an MFA Engineering Geologist reviewed readily available geologic and soils information for the project corridor using GIS layers, associated geologic data, and associated Soil Survey Geographic (SSURGO) data from Natural Resources Conservation Service (NRCS).
2. *Site reconnaissance:* An MFA Engineering Geologist visited the site to assess accessibility to the site and to stake proposed test pit locations.
3. *Field Investigation:* We conducted a geotechnical investigation consisting of six borings to 10 feet depth. We conducted SPT sampling at the surface at boring B-1, but encountered rock. We moved over a few inches and conducted rock coring. The remainder of the borings were investigated by rock coring. Borings were

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drilled by a subcontracted driller under the technical supervision of an MFA engineering geologist, who logged the borings and recover the cores for laboratory review. We collect one surface bulk sample from one boring location, but it consisted largely of rock. We collected two bulk samples from the large berm onsite – one at the top and one near the toe.

Prior to our investigation, we obtained utility clearance via the Hawaii One-call process.

No survey was included in our scope. We staked six locations in the field, and they were surveyed by others. However, you subsequently requested us to change the boring locations based on revisions to the proposed site layout. Because the new locations were within a 100-foot radius of the initial locations, and our initial Hawaii One Call request had asked for clearance of a 100-foot radius, we did not repeat the One Call process. We were unable to drill at the exact locations you requested due to existing features (baffles, guy wires, and berms) so we adjusted locations as necessary based on proximity to your proposed boring locations and planned layout.

Bore holes were backfilled with bentonite. Yellow survey flags were placed at the locations to enable you to survey them if desired.

4. *Lab Testing:* Recovered samples were returned to our laboratory for examination and appropriate laboratory testing. Testing included compaction, CBR, and identification tests.
5. *Shear wave velocity test:* A shear wave velocity test was conducted at the site by a subconsultant.
6. *Engineering Analyses and Report:* We have conducted engineering analyses to develop the geotechnical recommendations presented in this report.

The following scope of work was proposed and is anticipated:

7. *Consultation during design:* We would provide design consultation to the project structural and civil designers and contractor as required, including clarification of our geotechnical recommendations and addressing additional geotechnical design issues that may arise. We anticipate our scope of work would include reviewing plans and specification sections for conformance with our recommendations.

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8. *Consultation during construction:* During construction, we would monitor overexcavation, proofrolling, and compaction of fills and backfills.

3.0 SITE CONDITIONS

3.1 Regional Geology

The Hawaiian Archipelago is a 1600 miles long group of islands, reefs, and shoals running northwest – southeast in the Pacific Ocean. The major islands, in the southeast part of the archipelago, “are basaltic volcanic domes in various stages of dissection.”¹ The islands have complex geologic histories that generally include four stages of volcanism, water and wind erosion, sea level change, catastrophic landslides and accompanying tsunami, and subsidence of the crust due to the loads of the volcanoes. The older volcanoes are experiencing rebound of the crust as they erode and the load gets lighter.

The Island of Hawai‘i, the youngest island in the archipelago, consists of five shield volcanoes, listed in order of latest volcanic activity: Kohala in the northwest, Mauna Kea in the north-central portion, Hualālai in the west, Mauna Loa in the south, and Kilauea in the southeast². A sixth volcano, Māhukona, is submerged to the northwest. The chain’s newest volcano, Lō‘ihi, has not yet broken the surface, and lies southeast of the Island of Hawai‘i³.

The four stages of eruption of an idealized Hawaiian volcano are: preshield, shield, postshield, and rejuvenated. They are distinguished by lava composition, eruptive rate and style, and stage of development. The rejuvenated stage occurs after a few million years of volcanic quiescence. There are no preshield lavas exposed on The Island of Hawaii. Kilauea and Mauna Loa are considered by this definition to be shield-stage volcanoes, while Hualālai, Mauna Kea, and Kohala are postshield. None has reached rejuvenated stage⁴.

The oldest parts of Kohala are estimate to be about 1 million years old (Ma), with the exposed flows are all younger than 0.78 Ma. The youngest flows are probably at least

¹ Stearns, Harold T. 1966. *Geology of the State of Hawaii*. Palo Alto: Pacific Books.

² Peterson, D.W. and Moore, R.B. 1987. *Geologic history and evolution of geologic concepts, Island of Hawaii*. U.S. Geological Survey Professional Paper 1350, pp. 149-189.

³ Sherrod, D.R., Sinton, J.M., Watkins, S.E., and Brunt, K.M. 2007. *Geologic Map of the State of Hawai‘i* [with accompanying text]. Open-File Report 2007-1089. United States Geological Survey.

⁴ Wolfe, E.W. and Jean Morris. 1996. *Geologic Map of the Island of Hawaii*. [with accompanying text, I-2524-A]. United States Geological Survey.

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as young as about 0.12 Ma and possibly younger. The youngest flows of Mauna Kea youngest flows are estimated to be less than 10,000 years old. Mauna Kea is the highest summit in the state and the state's only known volcano to have been glaciated⁵. Hualālai, Mauna Loa, and Kilauea have all erupted since A.D. 1790⁶.

3.2 Local Geology

Mauna Loa is the world's largest volcano, with a volume "in the range of 65,000-80,000 km³...The volcano's growth has been accompanied by several large landslides."⁷ The oldest of the volcano's exposed subaerial rocks are lava flows of the Ninole Basalt, thought to be 0.1 – 0.2 Ma in age. They are found in the south flank of the volcano, roughly north by west, west, and southwest of the town of Pāhala. "Younger lava flows from Mauna Loa are divided into two formations on the basis of an intervening thick ash deposit found on the lower southwestern flank of the volcano. The older of the two is the Kahuku Basalt, which is sparsely exposed in two escarpments on the lower southwest rift zone. The younger, and far more widespread, is the Ka'ū Basalt....The intervening ash deposits are probably best known from the area near Pāhala, from which comes the name most commonly assigned to them, Pāhala Ash. The unit consists of numerous primary and reworked beds that accumulated over a substantial period of time. Most of the glass is devitrified and altered, which has hindered efforts to subdivide the unit in a way that leads to new stratigraphic or structural insight."⁸ The ash deposits are predominantly 30,000 to 13,000 years old. It is possible that Mauna Loa was glaciated in the time of the last glaciation 25,000 – 15,000 years ago, and that explosive eruptions related to glaciation may have factored into the genesis of the Pāhala Ash⁹.

It is not anticipated that Pahala ash will be encountered in the project area. However, we provide a description in the event it is encountered. Stearns and Macdonald's (1946) description of the Pahala ash, which formed chiefly from very light pumice and Pele's hair, indicates that: "The ash is so friable, especially at the top, that the deposit is on the borderline between a tuff and an ash...It fell like snow and mantles the entire terrane regardless of height or irregularities. The dip of the ash is controlled by the slope of the rocks on which it fell...The Pahala ash ranges from a single bed 55 feet thick in the vicinity of Pahala to several beds totaling about 15 feet interstratified with and overlying lavas in the Hilo district Further discussion indicates "in most areas weathering has altered the ash to a fine grained aggregate of palagonitic clay minerals.

⁵ Sherrod, et al. *Op cit.*

⁶ Wolfe and Morris, *Op cit.*

⁷ *Ibid*, p. 50.

⁸ *Ibid*, pp. 50-51.

⁹ *Ibid.*, p. 51.

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The originally sandy texture has been largely lost in wet areas and clay-like properties dominate.”¹⁰

3.3 Site Geology

The proposed project is mapped as falling completely within a single geologic unit (symbol Qk3); lava flows of the Kau Basalt, with an age range of 750-1,500 years¹¹. Geologic units are presented on *Figure 2, Project Geologic Map*. The accuracy of the geologic units for the Island of Hawaii is ± 50 m; therefore, no portion of the project site is expected to fall within a different geologic unit.

The Kau Basalt flows originated from Mauna Loa volcano. Sherrod *et al.*'s Description of Map Units describes the Kau Basalt as “Lava flows (unit Qk), vent deposits (unit Qkc), littoral deposits (unit Qkld) and tephra deposits (unit Qka) of tholeiitic basalt and rare transitional and alkalic basalt. Among lava flows, pāhoehoe slightly more abundant than ‘a‘ā. Variably porphyritic, with phenocrysts of olivine, plagioclase, and rarely, pyroxene. Divided on the basis to lithology and age according to the following matrix (y, younger; o, older).¹²” That is, Qk5 is the youngest lava flow at age 0-200 years, while Qk is the oldest, at age greater than 11,000 years.

Wolfe and Morris (1996), elaborate on the Kau Basalt: “Vesicular pahoehoe that was fed by vigorous lava fountains dominates along the rift zones but changes down slope to aa that commonly forms relatively long, narrow flows. Data for historic eruptions (Paterson and Moore, 1987) indicate that many of these flows formed during relatively brief (1 to 3 weeks) eruptions that had high rates of lava output. Such conditions favor development of an extending, narrow, open lava channel, confined within levees of its own making, that efficiently delivers lava to a broad toe of slowly advancing aa (Lipman and Banks, 1987). In contrast, some of the longest flows, such as...the 1880-81 flow, which reached Hilo, were produced by more protracted eruptions (300 and 280 days, respectively) in which slower, steady lava output led to formation of lava tubes and production of dense tube-fed pahoehoe.”¹³

¹⁰ Stearns, H.T. and G.A. Macdonald. 1946. *Geology and Ground-water Resources of the Island of Hawaii*. [Bulletin 9.] Hawaii Division of Hydrography. pp. 72-74.

¹¹ Sherrod, D.R., Sinton, J.M., Watkins, S.E., and Brunt, K.M. 2007. *Geologic Map of the State of Hawai'i*. [GIS layer] Open-File Report 2007-1089. United States Geological Survey.

¹² Sherrod, D.R., Sinton, J.M., Watkins, S.E., and Brunt, K.M. 2007. *Geologic Map of the State of Hawai'i* [with accompanying text]. Open-File Report 2007-1089. United States Geological Survey. p. 79.

¹³ Wolfe and Morris. *Op cit.*, p.12.

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Stearns and Macdonald (1946) indicate that “Some of the Kau lavas interfinger with and overlie Recent lavas of Hualalai and Kilauea volcanoes and are distinguished with difficulty...Between Kilauea Caldera and Keaau, the Kau lavas are overlapped by the latest Puna lavas from Kilauea, but below the surface the lavas of the two series probably interfinger. The Kau lavas form a thin veneer, commonly one flow thick, on the lower slopes of Mauna Loa, but they thicken toward the summit...The lavas are chiefly porphyritic or nonporphyritic aa and pahoehoe basalts. Olivine basalts are abundant. The flows average about 15 feet in thickness...The surface of prehistoric lava flows of the Kau volcanic series is usually brown in contrast to the black of the historic lava flows. Most are too recent to carry sufficient soil for tilling, although the older ones carry sufficient soil to support vegetation and coffee plantations. Tubes and minor structures typical of recent lava flows are common in the Kau lavas...The lavas of the Kau volcanic series are highly permeable and carry brackish water along all coasts except near Hilo, where they yield potable water. They carry perched water bodies where they overlie Pahala ash in wet areas.”¹⁴

3.4 Site Soils

Soils in the project area were mapped by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)¹⁵.

The project site falls entirely within the Map Unit 664: *Opihikao highly decomposed plant material, 2 to 20 percent slopes*. The Soil Survey Geographic (SSURGO) database for Island of Hawaii indicates that this soil has the following properties:

- Landform: Pahoehoe lava flows
- Parent material: Organic material over pahoehoe lava
- Typical Profile
- 0 to 3 inches: highly decomposed plant material
- 3 to 13 inches: bedrock

Just northwest of the project site, the soil is mapped as Map Unit 628: *Papai extremely cobbly highly decomposed plant material, 2 to 10 percent slopes*, with the following properties:

- Landform: Aa lava flows
- Parent material: Organic material over aa lava

¹⁴ Stearns and Macdonald. *Op cit.*, pp.76-77.

¹⁵ U.S. Department of Agriculture, Natural Resources Conservation Service. 2012. *Soil Survey Geographic (SSURGO) database for Island of Hawaii* [area hi801]. Retrieved May 1, 2013 from <http://SoilDataMart.nrcs.usda.gov/>

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Typical Profile

0 to 10 inches: extremely cobbly highly decomposed plant material
10 to 53 inches: cobbles
53 to 63 inches: bedrock

A soils map is presented as *Figure 3, Project Soils Map*. The Soil Survey for this area was mapped at a 1:24,000 scale.

Soils in the project area had previously been mapped in 1973 by the USDA Soil Conservation Service (SCS), predecessor to the NRCS¹⁶. Because of the variance in soils mapping in the general area of the project, we have presented both the current map and the 1973 version. We note that both versions indicate pāhoehoe for the area in which construction is proposed.

In the 1973 map, almost all of the project site is mapped as *Lava flows, pahoehoe (rLW)*. The southeast tip – where no construction is currently planned – is mapped as *Papai extremely rocky muck, 3 to 25 percent slopes (rPAE)*. The 1973 soils map is presented as *Figure 3A, 1973 Soils Map*. The Soil Survey for this area was mapped at a 1:24,000 scale.

The 1973 Soil Survey describes *Lava flows, pahoehoe*, as follows: “This lava has a billowy, glassy surface that is relatively smooth. In some areas, however, the surface is rough and broken, and there are hummocks and pressure domes. Pahoehoe lava has no soil covering and is typically bare of vegetation except for mosses and lichens. In the areas of higher rainfall, however, scattered ohia trees, ohelo berry, and aalii have gained a foothold in cracks and crevices. This miscellaneous land type is at an elevation from sea level to 13,000 feet. The annual rainfall ranges from 10 inches to more than 140 inches.”¹⁷

The *Papai series* is described as consisting of “well-drained, thin, extremely stony organic soils over fragmented Aa lava.” The soil *rPAE*, in a representative profile, consists of 3-12 inches of very brown extremely stony muck; moderate, medium, and fine, subangular block structure; friable, slightly sticky, slightly plastic, and moderately smeary. This overlies fragmented ā’a lava with a small amount of the above material in voids and cracks¹⁸.

¹⁶ United States Department of Agriculture Soil Conservation Service [in cooperation with The University of Hawaii Agricultural Experiment Station]. 1973. *Soil Survey of Island of Hawaii, State of Hawaii*. Washington, DC: U.S. Government Printing Office.

¹⁷ *Ibid.* p.34.

¹⁸ *Ibid.* p.46.

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3.5 Site Geomorphology

Site geology and soils generally conform with published data. Topography of the project site generally reflects the underlying geology, suggesting pāhoehoe lava flows, with several man-made berms. The berms that parallel the existing baffles (i.e. running WSW-ENE) are low, on the order of approximately 3-4 feet. The large “backstop” berm that runs the roughly NNW-SSE along the length of the west side of the project area rises to approximately 80 feet MSL.

Surface elevation is approximate 65 feet above mean sea level (MSL). General area contours are presented on *Figure 4, Project Contour Map*.

At the time of our initial site reconnaissance in January 2013 to mark proposed test pit locations (prior to change in scope) and our investigation in April 2013, the site was generally covered with short manicured grass and outcropping pāhoehoe. The large backstop berm was thickly vegetated with tall California grass, trees, and other vegetation. This berm is depicted on *Figure 5, Boring Location Map*.

Site geology and soils generally conform to the published information: the project site is comprised of pāhoehoe lava flows. However, the pāhoehoe is in thick flows with no observed voids. The pāhoehoe is vesicular, but with small vesicles. Although geologically pāhoehoe, the material is hard and no large blisters, tumuli, lava tube caves and collapse features were observed. Therefore, for engineering purposes, the material is more typical of ‘a‘ā core rock.

4.0 FIELD INVESTIGATION AND LABORATORY TESTING

4.1 Geotechnical Investigation

MFA’s geotechnical investigation was conducted from April 11-12, 2013. Under the technical supervision of an MFA engineering geologist, six borings were drilled / cored on by GeoTek Hawaii, Inc., utilizing a Mobile B-59 drill rig. The locations of the borings are indicated on *Figure 5*. We attempted SPT sampling at the surface of the first boring, but encountered basalt rock almost immediately. Thereafter, all borings were cored with an HQ (2.5-in. ID) core barrel. Borings were drilled to 10 feet below ground surface. No groundwater was encountered. Borings were backfilled with bentonite.

Thickness of soil cover ranged from 0 to 3 inches. The near-surface basalt generally contained many small vesicles, with the vesicles becoming fewer and larger with depth. The basalt became denser, as well as fresher (less weathered) with depth. Cores were recovered during the course of the investigation. Photos of the cores are

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presented in *Appendix A, Rock Core Photos*. Cores will be retained in MFA's lab for 30 days after delivery of this report, after which they will be discarded unless we are requested to retain them for a longer period.

A bulk sample was collected from boring B-4, as representative of all the borings. We had to break up rock with a shovel to enable us to collect a 5-gallon bucket of the material. However, too much material was retained on the ¾-inch sieve to enable compaction or CBR testing.

MFA conducted a reconnaissance of the adjacent quarry. No large voids or caves were observed. Photos of the quarry wall area adjacent to the project site are provided in *Appendix B, Photos of Adjacent Quarry Wall*. Location of the quarry is indicated on *Figure 4*.

MFA conducted a reconnaissance of the existing backstop berm. The berm was thickly vegetated, but the material comprising the berm, where observed, appeared to be a mixture of basalt sand, gravel, and cobbles. Two bulk samples were collected in the area where the berm is to be widened to support the facility structure. One sample was collected from the top of the berm the other from just above the toe. Photos of the berm are provided in *Appendix C, Photos of Backstop Berm*. These photos additionally show boring locations marked by yellow survey flags.

Soils encountered were classified in accordance with the Unified Soil Classification System, *Exhibit 1*. Boring logs are presented as *Figure 6, Logs of Borings*, with a Boring Legend provided as *Exhibit 2*. Coordinates listed on the boring logs are from a hand-held GPS receiver and are therefore approximate. A Rock Description System to assist with understanding the boring logs is provided as *Exhibit 3*.

4.2 Laboratory Testing

Laboratory testing was primarily directed towards developing data for foundation design. Laboratory testing consisted of identification tests (gradation tests), compaction (Proctor) tests and California Bearing Ratio (CBR) tests. Laboratory test results are presented in *Appendix D*.

The soils from the berm were classified as poorly-graded sand with gravel; the soils from B-4 were classified as well-graded gravel with sand. All the material was non-plastic. CBR tests demonstrate relatively high bearing capacities for the *in-situ* soils.

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4.3 Shear Wave Velocity Test

A shear wave velocity test was conducted at the project site. The shear wave velocity test report is presented as *Appendix E*.

5.0 GEOTECHNICAL RECOMMENDATIONS

5.1 General

Subsurface conditions will require site preparation for development of the proposed project. Following site preparation, the proposed structures can be supported on shallow foundations consisting of spread footings founded on in-situ basaltic rock, structural fill or structural rock fill.

Subsurface conditions underlying the structures are anticipated to consist of in-situ or previously graded pāhoehoe lava. We recommend clearing and grubbing of the surface soils and vegetation, and grading of the site to near finish grades by cutting of the basaltic rock or by placement of structural fill or structural rock fill. The use of structural boulder fill is also feasible if deep fill areas are planned.

Proofrolling of the subgrade following cuts or prior to placement of fills is recommended to check for shallow cavities and loose areas.

For the relatively light structures planned, we recommend an allowable bearing capacity of 2500 PSF with a 1/3 increase for wind and seismic loads.

Higher capacities, if required, can be assigned for subgrades that are checked by probing for cavities. The geotechnical engineer should be consulted if higher bearing capacities are required.

5.2 Subgrade Preparation, Fill Materials and Placement

5.2.1 Subgrade Preparation

After excavation to recommended depths, the exposed subgrade should be proofrolled with at least 6 passes of a minimum 10-ton vibratory compactor, to check for any near-surface cavities or voids or loose areas. For the top of the backstop berm, it may be necessary to construct a temporary ramp to enable access.

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The proofrolling will also help to breakdown oversize particles to form a dense subgrade. Near-surface cavities, voids, or loose materials revealed during the proofrolling should be opened to the maximum extent practical and backfilled with properly compacted structural fill or structural rock fill. The proofrolling and near-surface cavity treatment should be performed under the observation of the soils engineer.

Site and foundation excavation can then be conducted to required depths.

Following excavation, the exposed subgrade soils should be reviewed by the soils engineer and compacted. We recommend that the surface of the excavated subgrade be compacted to 95% of maximum dry density (ASTM D-1557), and that compaction be compacted at approximately 2% above optimum moisture content. The soil will most likely contain too much oversized material to permit testing to determine whether or not materials meet compaction criteria; in this case, compaction should be conducted under visual observation of the soils engineer.

Near-surface voids, soft spots, debris, or unsuitable soils revealed during the subgrade preparation should be excavated and backfilled with properly compacted structural fill. Any required remedial work should be performed under the observation of the soils engineer.

5.2.2 Fill materials - On-site materials are anticipated to be suitable for use as fill materials. Materials to be used for fill are classified as follows:

5.2.2.1 Structural rock fill – On-site excavated pāhoehoe rock fragments which are screened or crushed to materials with less than 6-inches maximum dimension. Structural rock fill requires the use of large compactors of at least 30 tons weight.

5.2.2.2 Structural fill - If imported fills are required to construct structural fills, this material may consist of select granular fill with a minimum CBR value of 30% and CBR expansion of less than 2%.

5.2.3 Fill Placement

5.2.3.1 Structural rock fill - Structural rock fill should be placed in 12-inch thick loose lifts of on-site pāhoehoe rock fragments. Any oversize fragments should be bladed out by a dozer. The material placed in each lift should consist of a well-graded mixture of rock fragments. The structural rock fill should be compacted

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by a large sheepsfoot compactor of at least 30-ton weight (Caterpillar 825B for example).

Compaction testing of the structural rock fill is not practical because of the size of the particles in this material. The adequacy of compaction should be determined by on-site evaluation of the material placement and compaction procedures. Appropriate compaction procedures should be developed during the initial stages of the earthwork, including correlating the required number of passes of the compaction equipment with the apparent density of the fill. The fill placement and compaction operation should be observed by the soils engineer on a full-time basis to determine when sufficient passes have been made, and additional passes do not produce an increase in apparent density.

5.2.3.2 Backstop berm - For the widening of the berm, we recommend that slope construction be performed using benching at approximately 3 foot vertical height intervals, to enable compaction on flat surfaces. The existing face should be cut into benches to allow for the keying-in of the new material. Slopes should be overfilled and compacted to 90% of maximum dry density, and then graded back to the final slopes. Slopes should be constructed at a maximum slope of 2 horizontal to 1 vertical.

The geotechnical engineer should be consulted if steeper slopes are required or anticipated.

5.2.3.3 Structural fill - Structural fill material should be placed in 8-inch thick loose lifts, moisture conditioned to near optimum moisture content, and compacted to at least 95 percent of maximum dry density based on ASTM D-1557.

5.2.3.4 Non-structural fill - Non-structural fills should be compacted to at least 90% of maximum dry density. Non-structural fills constructed using boulder or structural rock fill materials should be monitored by the soil engineer to check on adequacy of the compactive effort.

5.3 Cavity Probing

Cavity probing is not anticipated to be required since heavier structures are not anticipated. We should be consulted if heavier structures are planned.

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5.4 Footing Excavations

During footing excavations, if hard and dense basaltic rock is encountered at the bottom of the excavations, the footings can be constructed directly on the rock. However, if the structure will bear on both cut and fill subgrades, the basaltic rock at the bottom of footing excavations should be overexcavated to a depth of 2 feet and replaced with compacted structural fill or structural rock fill, to enable uniform support for the foundations for a particular structure.

All footing excavations should be visually inspected by the soils engineer, prior to placement of steel reinforcement.

5.5 Foundation Support

An allowable bearing pressure of 2500 pounds per square foot (PSF) is recommended for footings on basaltic rock, structural fill or structural rock fill placed over a proofrolled subgrade. Per your request, a signed Declaration of Soil Bearing Capacity is provided, as *Appendix F*.

A 1/3 increase in allowable bearing pressure may be used for wind and seismic loadings. The existing backstop berm is considered to consist of structural fill.

Footings should have a minimum width of 16 inches and should be embedded a minimum of 12 inches below the lowest adjacent exterior grades. Settlement of the building footings is estimated to be on the order of 1/4 inch and should occur fairly rapidly as the load is applied.

5.6 Lateral Support

Lateral loads can be resisted by passive pressure on the faces of footings and by friction along the base of footings. Lateral pressures on footings in compacted fill material can be computed using a passive equivalent fluid pressure of 350 pounds per square foot per foot of depth (PSF/ft). Friction factors can be taken as 0.5 along the bases of footings.

For backfill with on-site volcanic materials or imported structural fill, active and at-rest pressures due to 30 and 50 PCF equivalent fluids are anticipated.

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5.7 Floor Slabs and Pavements

See section on *Subgrade Preparation, Fill Materials and Placement* for preparation of all areas underlying floor slabs and pavements.

Following site preparation, we recommend that slabs on grade be supported on a four-inch layer of free draining gravel to serve as a cushion layer providing uniform support for the slab.

Assuming that the traffic will consist mainly of passenger vehicles and occasional heavier vehicles, we recommend a pavement section consisting of 6 inches of compacted aggregate base course and 2 inches of asphaltic concrete.

5.8 Seismic Site Classification

A shear wave velocity test was conducted on the site by a subcontractor, AECOM Technical Services. The results are presented in Appendix E.

Based on the results of the shear wave velocity test, Seismic Site Class C is indicated under the International Building Code (IBC).

5.9 Plan Review and Services during Construction

MFA should review plans and specifications prior to construction to check for conformance with the intent of our recommendations. During mass grading, we recommend that MFA be retained to observe site preparation, excavation, subgrade treatment, and fill placement and compaction. During foundation construction, MFA should be retained to check the footing excavations prior to concrete placement.

6.0 LIMITATIONS

The geotechnical recommendations and conclusions presented in this report are based on the following assumptions:

1. The scope of the construction project, as described, does not change appreciably.
2. Significant variations in subsurface properties from those encountered during our investigation do not occur.
3. A geotechnical engineer-of-record will be retained to observe actual field conditions encountered during construction to check the applicability of the

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recommendations presented in this report and to recommend appropriate changes in design or construction procedures, if differing conditions occur.

This report was prepared for the use of SAIC Energy, Environment & Infrastructure, LLC (SEE&I) and the Hawaii Army National Guard, in accordance with generally accepted geotechnical engineering principles and practices, and may not be suitable for the use of other parties.

Our services were provided consistent with normal standard of practice. No other representation is intended or implied.

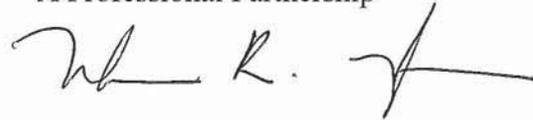
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It has been our pleasure to prepare this geotechnical letter report for you. Please contact the undersigned if there are any questions regarding this letter report.

Respectfully submitted,

MASA FUJIOKA & ASSOCIATES
A Professional Partnership



Masanobu R. Fujioka, P.E.
Managing Partner

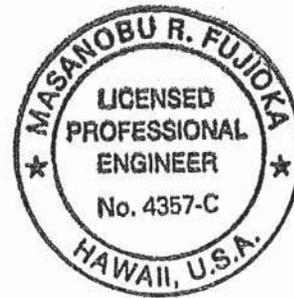
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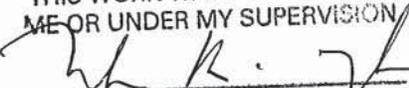
Figure 1. Project Location Map
Figure 2. Project Geologic Map
Figure 3. Project Soils Map
Figure 3A. 1973 Soils Map
Figure 4. Project Contour Map
Figure 5. Boring Location Map
Figure 6. Logs of Borings

Exhibit 1. Unified Soil Classification System
Exhibit 2. Boring Legend
Exhibit 3. Rock Description System

Appendix A. Rock Core Photos
Appendix B. Photos of Adjacent Quarry Wall
Appendix C. Photos of Backstop Berm
Appendix D. Lab Test Data
Appendix E. Shear Wave Velocity Test Report
Appendix F. Declaration of Soil Bearing Capacity



THIS WORK WAS PREPARED BY
ME OR UNDER MY SUPERVISION


LICENSE EXPIRES: 4-30-14

FIGURES

Figure 1. Project Location Map

Figure 2. Project Geologic Map

Figure 3. Project Soils Map

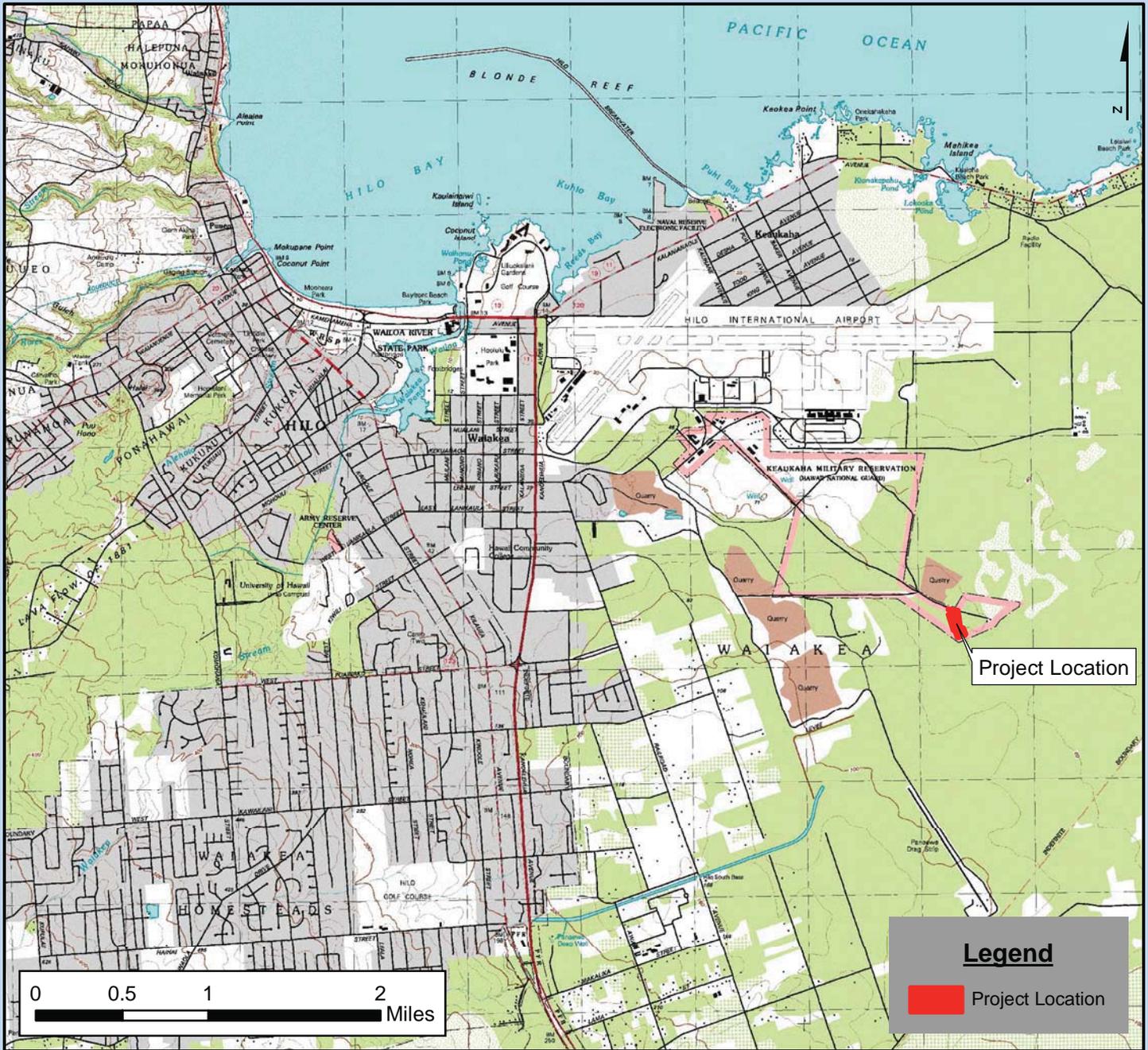
Figure 3A. 1973 Soils Map

Figure 4. Project Contour Map

Figure 5. Boring Location Map

Figure 6. Logs of Borings

HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Project Location



Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: April 2013

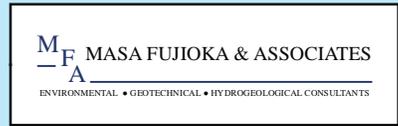
Notes:

1. Topographic map source: U.S. Geological Survey, Western Geographic Science Center. December 2004. Hawaii (Big Island) Digital Raster Graphic. Derived from the 7.5-minute, 1:24,000-scale raster images of scanned USGS topographic or planimetric maps and mosaicked. Retrieved from Hawaii Data Clearinghouse, <http://hawaii.wr.usgs.gov/>

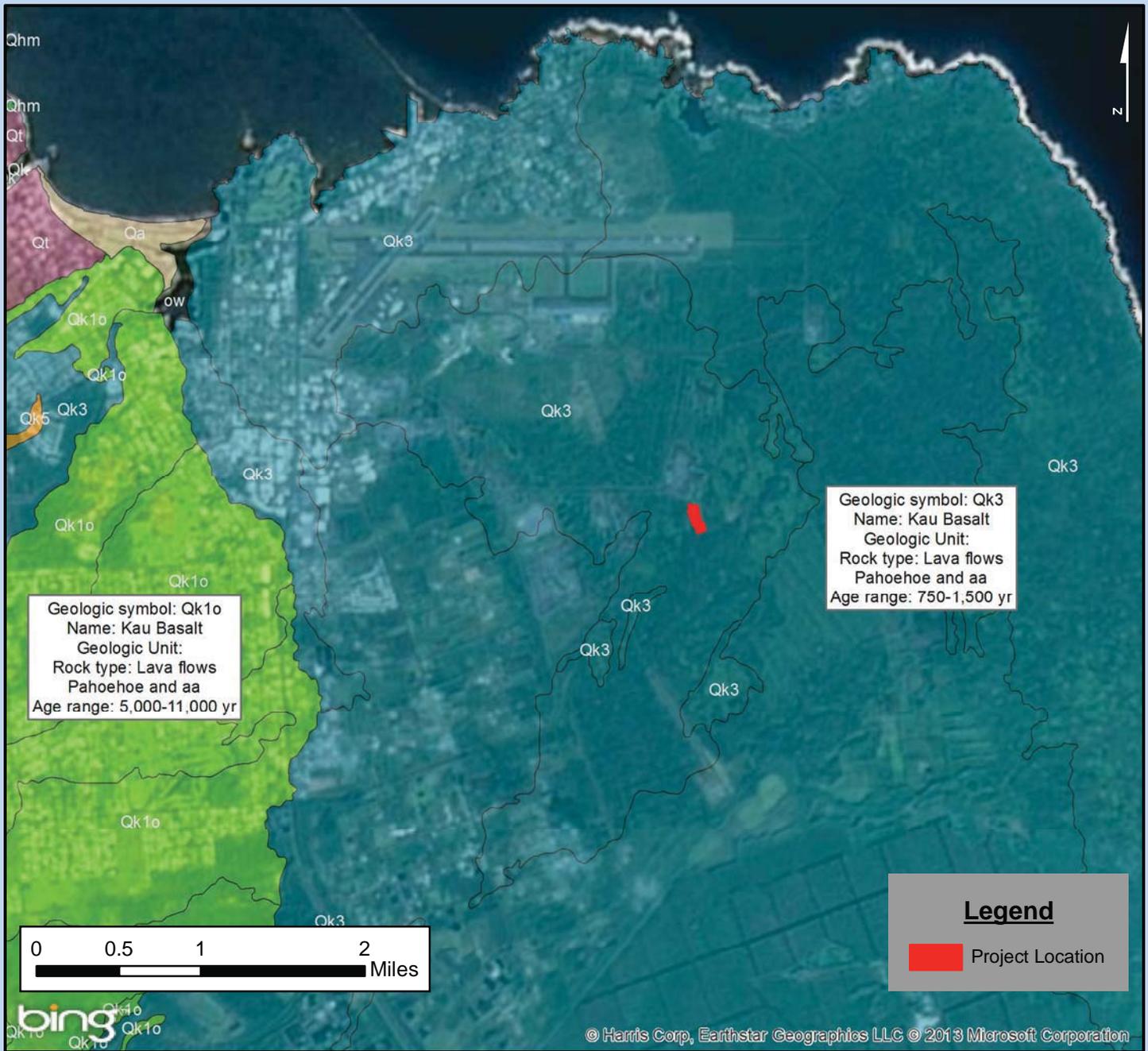
Figure 1

Project Location Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**



HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Project Location



Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: April 2013

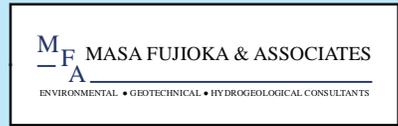
Notes:

1. Geology data source: Sherrod, David R., J.M. Sinton, S.E. Watkins, and K.M. Brunt. 2007. Geologic map of the State of Hawai'i: U.S. Geological Survey Open-File Report 2007-1089 [<http://pubs.usgs.gov/of/2007/1089/>]. Note that map unit boundaries are only as accurate as the source data; contacts should be considered approximate. Standard error is 100 m (± 50 m).

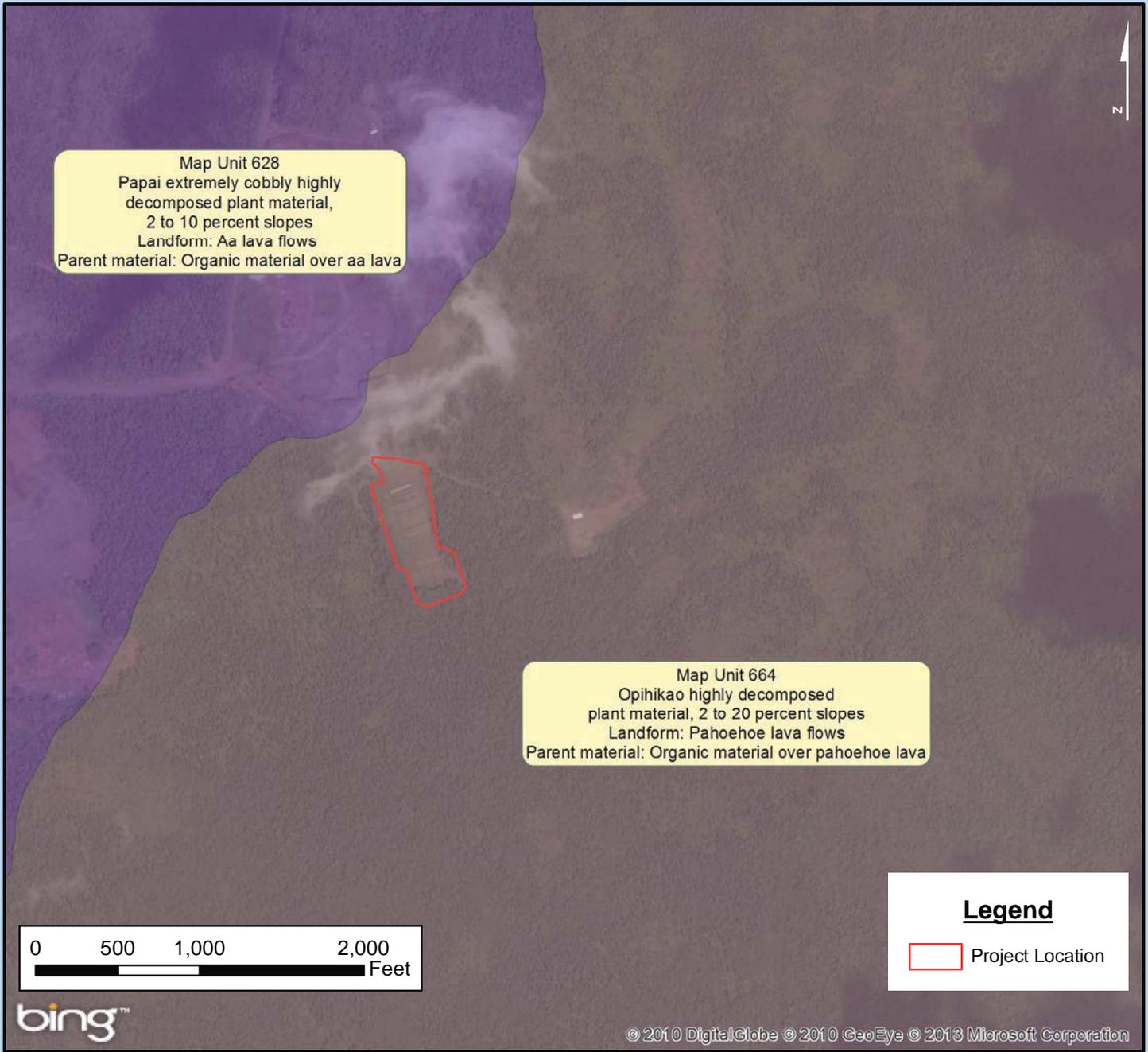
Figure 2

Project Geologic Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**



HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Project Location



Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: May 2013

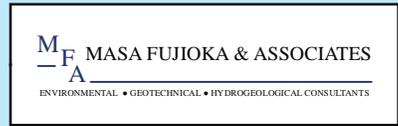
Notes:

1. Project boundary from Sheet C-100 of "HIARNG KMR 25MZ Baffled Range - Concept Drawings 15-Feb-13", geo-referenced by MFA to aerial imagery. This process introduces error: boundary should be considered approximate. Note that site plan has changed; as of report date, project includes only northern approximately half of depicted project area.
2. Soils data source: U.S. Department of Agriculture, Natural Resources Conservation Service. 2012. Soil Survey Geographic (SSURGO) database for Island of Hawaii [area hi801]. Retrieved May 1, 2013 from <http://SoilDataMart.nrcs.usda.gov/>
 Contacts should be considered approximate.

Figure 3

Project Soils Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**



HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Project Location



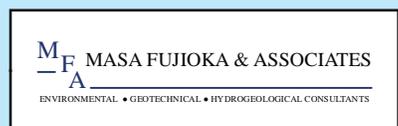
Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: May 2013

Notes:

1. Project boundary from Sheet C-100 of "HIARNG KMR 25MZ Baffled Range - Concept Drawings 15-Feb-13", geo-referenced by MFA to aerial imagery. This process introduces error: boundary should be considered approximate. Note that site plan has changed; as of report date, project includes only northern approximately half of depicted project area.
2. Soils data source: USDA Natural Resources Conservation Service. 1972. Soils [State GIS layer], with associated Soil Survey Geographic (SSURGO) data. Retrieved May 2009 from Hawaii Statewide GIS Program website, <http://hawaii.gov/dbedt/gis/download.htm>. Map unit boundaries are only as accurate as the source data; contacts should be considered approximate.

Figure 3A 1973 Soils Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**



HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Project Location



Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: April 2013

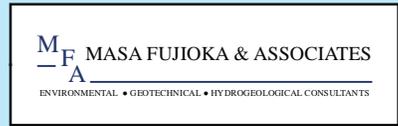
Notes:

1. Project boundary from Sheet C-100 of "HIARNG KMR 25MZ Baffled Range - Concept Drawings 15-Feb-13", geo-referenced by MFA to aerial imagery. This process introduces error: boundary should be considered approximate. Note that site plan has changed; as of report date, project includes only northern approximately half of depicted project area.
2. Contour layer source: U.S. Geological Survey, Western Geographic Science Center. December 2004. Hawaii [Big Island] Hypsography - 40 ft Contour Interval. Digitized from USGS maps. Retrieved from Hawaii Data Clearinghouse, <http://hawaii.wr.usgs.gov/>

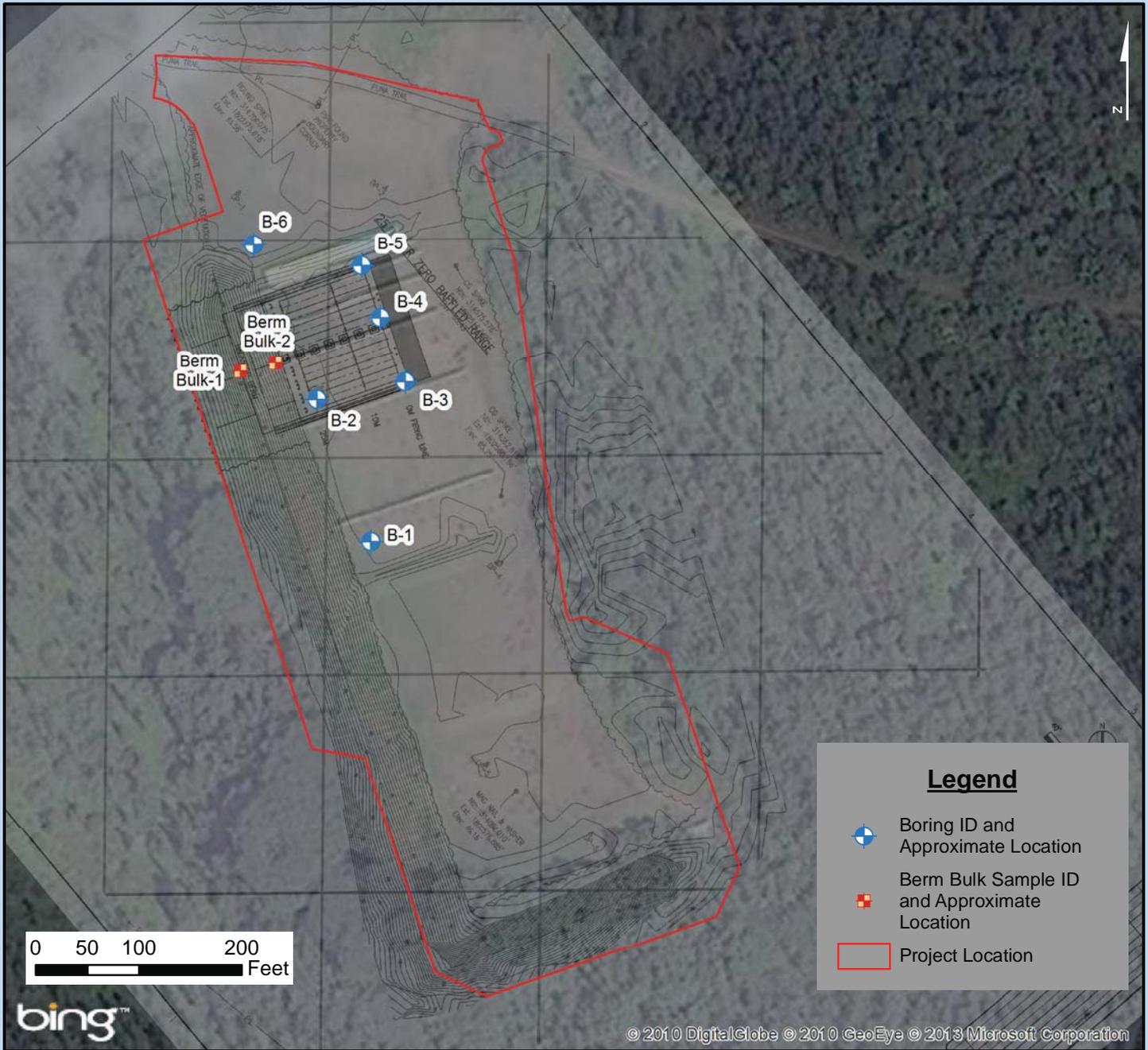
Figure 4

Project Contour Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**



HIARNG Baffled Range, Keaukaha Military Reservation, Hilo



Legend

-  Boring ID and Approximate Location
-  Berm Bulk Sample ID and Approximate Location
-  Project Location

Project Location



Project: 12555-002
 Approved: MRF
 Drawn: ECL
 Date: April 2013

Notes:

1. Site plan is "KMR Revised Layout", provided to MFA by SAIC on March 19, 2013.
2. Project boundary from Sheet C-100 of "HIARNG KMR 25MZ Baffled Range - Concept Drawings 15-Feb-13".
3. Both of above geo-referenced by MFA to aerial imagery. This process introduces error: both should be considered approximate.
4. Boring locations were not surveyed; they were plotted based on distances to existing features. Margin of error may be several feet; locations should be considered approximate.
5. Berm bulk sample locations are approximate.

Figure 5

Boring Location Map

**Proposed HIARNG Baffled Range
 Keaukaha Military Reservation
 Hilo, Island of Hawai'i, Hawai'i**

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Boring: B-1
HIARNG Baffled Range
Hawaii Army National Guard
KMR, Hilo, Hawaii Island

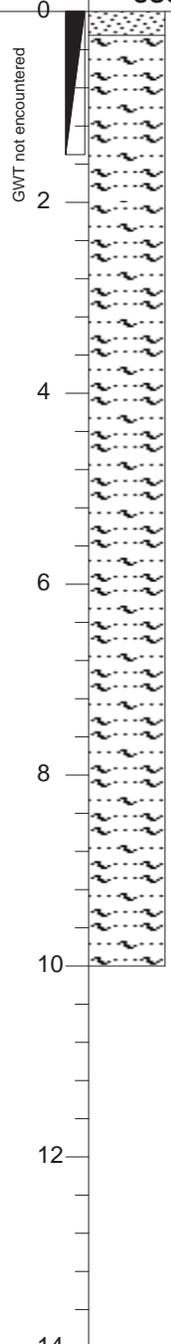
Figure: 6.1

Job Number: 12555-002

Location: 19° 41' 53.7"N, 155° 01' 44.4"W

Driller: GeoTek		Drilling	Date: 2013 April 11
Drill Method: Mobile B-59 Rig; HQ Core Pipe		Started: 1052	
Sample Method: 1.5" SPT		Finished: 1256	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL	Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	Material Description	Test Results
B1-1	54	62%	35%	0	<p>USCS Surface: Short grass</p> <p>Med. to dk brn clayey silty sand w/ grass roots (3"), moist</p> <p>Highly weathered, dk grey basalt, very soft, moist, small vesicles</p>	
				2	<p>Becomes moderately hard, colors to lt grey w/ large vesicles and some olivine crystals</p> <p>Becomes moderately weathered</p> <p>Becomes slightly weathered, hard</p>	
		100%	83%	4	<p>Becomes fresh</p>	
				6		
				8		
				10		
				12		
				14		



Boring terminated 10' bgs
No groundwater encountered

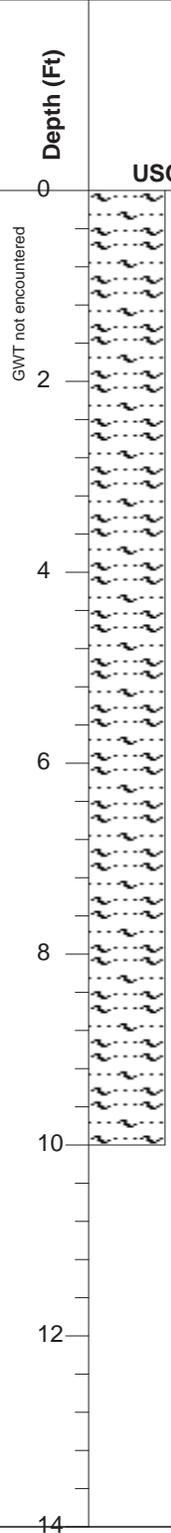
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Boring: B-2
 HIARNG Baffled Range
 Hawaii Army National Guard
 KMR, Hilo, Hawaii Island

Figure: 6.2
Job Number: 12555-002
Location: 19° 41' 55.2"N, 155° 01' 44.9"W

Driller: GeoTek		Drilling	Date: 2013 April 11
Drill Method: Mobile B-59 Rig; HQ Core Pipe		Started: 1330	
Sample Method:		Finished: 1443	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL	Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	USCS	Material Description	Test Results
				0		Surface: Short grass	
		93%	87%	0 - 2	Rx	Dk grey basalt w/ olivine crystals, w/ many small vesicles, slightly weathered, hard	
				2 - 4		Colors lt grey, grades larger, fewer vesicles	
				4 - 6		Grades denser with few but large vesicles, more olivine	
		100%	100%	6 - 8		Grades fewer vesicles	
				8 - 10			
				10 - 12			
				12 - 14			



Boring terminated 10' bgs
 No groundwater encountered

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Boring: B-3
HIARNG Baffled Range
Hawaii Army National Guard
KMR, Hilo, Hawaii Island

Figure: 6.3

Job Number: 12555-002

Location: 19° 41' 55.2"N, 155° 01' 43.9"W

Driller: GeoTek		Drilling	Date: 2013 April 11
Drill Method: Mobile B-59 Rig; HQ Core Pipe		Started: 1452	
Sample Method:		Finished: 1545	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL	Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	USCS	Material Description	Test Results
				0	SP RX	Surface: Short grass Dk brn silty clayey sand w/ grass roots	
		90%	74%	2		Dk grey basalt, hard, many small vesicles, slightly weathered, w/ olivine Grades fewer, larger vesicles, less olivine, less weathered	
				4		Grades dense, few large vesicles	
				6		Colors dk reddish grey on fracture planes	
		100%	87%	8		Colors dk grey	
				10		Colors dk reddish grey on fracture planes Boring terminated 10' bgs No groundwater encountered	
				12			
				14			

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Boring: B-4
 HIARNG Baffled Range
 Hawaii Army National Guard
 KMR, Hilo, Hawaii Island

Figure: 6.4
Job Number: 12555-002
Location: 19° 41' 56.0"N, 155° 01' 44.5"W

Driller: GeoTek	Drilling	Date: 2013 April 12
Drill Method: Mobile B-59 Rig; HQ Core Pipe	Started: 0705	
Sample Method: Shovel	Finished: 0821	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL
		Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	USCS	Material Description	Test Results
B-4		79%	64%	0	GW Rx	Surface: Short grass Well graded basalt gravel w/ dk brn sand and grass roots	Gradation
				2		Med. grey basalt w/ many small vesicles and olivine crystals, slightly weathered, soft	
				4		Grades hard, fewer, larger vesicles, colors lt grey	
				6		Grades denser (fewer vesicles)	
				8		Grades denser	
		100%	100%	10			
				12			
				14			
						Boring terminated 10' bgs No groundwater encountered	

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Boring: B-5
HIARNG Baffled Range
Hawaii Army National Guard
KMR, Hilo, Hawaii Island

Figure: 6.5

Job Number: 12555-002

Location: 19° 41' 56.1"N, 155° 01' 44.6"W

Driller: GeoTek		Drilling	Date: 2013 April 12
Drill Method: Mobile B-59 Rig; HQ Core Pipe		Started: 0830	
Sample Method:		Finished: 0922	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL	Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	USCS	Material Description	Test Results
				0	Rx	Surface: Short grass Med. grey basalt, moderately weathered, many small vesicles, dk brn coloring	
		80%	73%	2		Grades slightly weathered w/ few weathered olivine crystals, colors lt grey, hard	
				4		Grades denser (fewer, larger vesicles)	
				6		Grades denser	
				8		Colors brownish rust on fracture faces	
		100%	100%	10			
				12			
				14			

Boring terminated 10' bgs
No groundwater encountered

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Boring: B-6
HIARNG Baffled Range
Hawaii Army National Guard
KMR, Hilo, Hawaii Island

Figure: 6.6

Job Number: 12555-002

Location: 19° 41' 56.5"N, 155° 01' 45.4"W

Driller: GeoTek		Drilling	Date: 2013 April 12
Drill Method: Mobile B-59 Rig; HQ Core Pipe		Started: 0930	
Sample Method:		Finished: 1010	
Borehole Diameter: 2.5" ID	Water Level : N/A	Logged By: ECL	Checked By: MRF

Sample #	Blows / Foot	Recovery	RQD	Depth (Ft)	USCS	Material Description	Test Results
				0	Rx	Surface: Short grass	
		84%	73%	0 - 2		Dk grey basalt, moderately weathered, med. brn rust in fractures, many small vesicles, med. hard Becomes slightly weathered, hard, w/ few olivine crystals	
				2 - 4		Grades denser (fewer, large vesicles), olivine, less weathered, colors lt grey	
				4 - 6		Grades denser	
				6 - 8		Grades denser	
		100%	100%	8 - 10			
				10 - 12			
				12 - 14			

Boring terminated 10' bgs
No groundwater encountered

EXHIBITS

- Exhibit 1. Unified Soil Classification System
- Exhibit 2. Boring Legend
- Exhibit 3. Rock Description System

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UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS	
			GRAPHIC	LETTER		
Coarse grained soils	Gravel and gravelly soils	Clean gravels (little or no fines)		GW	Well-graded gravels, Gravel, Sand mixtures, Little or no fines	
				GP	Poorly-graded gravels, Gravel-sand mixtures, Little or no fines	
		More than 50% of coarse fraction <u>retained</u> on No. 4 sieve	Gravel with fines (appreciable amount of fines)		GM	Silty gravels, Gravel-sand-silt mixtures
				GC	Clayey gravels, Gravel-sand-clay mixtures	
	More than 50% of material is <u>larger</u> than No. 200 sieve size	Sand and sandy soils	Clean sands (little or no fines)		SW	Well-graded sands, Gravelly sands, Little or no fines
					SP	Poorly-graded sands, Gravelly sands, Little or no fines
		More than 50% of coarse fraction <u>passing</u> on No. 4 sieve	Sands with fines (appreciable amount of fines)		SM	Silty sands, Sand-silt mixtures
					SC	Clayey sands, Sand-clay mixtures
Fine grained soils	Silts and clays	Liquid limit <u>less</u> than 50		ML	Inorganic silts and very fine sands, Rock flour, Silty or clayey fine sands or clayey silts with slight plasticity	
				CL	Inorganic clays of low to medium plasticity, Gravelly clays, Sandy clays, Silty clays, Lean clays	
				OL	Organic silts and organic silty clays of low plasticity	
	More than 50% of material is <u>smaller</u> than No. 200 sieve size	Silts and clays	Liquid limit <u>greater</u> than 50		MH	Inorganic silts, Micaceous or diatomaceous fine sand or silty soils
					CH	Inorganic clays of high plasticity, Fat clays
					OH	Organic clays of medium to high plasticity, Organic silts
Highly organic soils				PT	Peat, Humus, Swamp soils with high organic contents	

Note: Dual symbols are used to indicate borderline soil classifications

Boring Legend

Sample Type



Split Spoon Sample



Split Spoon No Sample Recovered



Disturbed Sample



Standard Penetration Test Sample



Standard Penetration Test No Sample Recovered



Core

Field Tests

pen = Pocket Penetrometer

tv = Torvane

Lab Tests

LL = Liquid Limit (ASTM D-4318)

PI = Plasticity Index (ASTM D-4318)

CBR = California Bearing Ratio (ASTM D-1883)

CBR Exp. = CBR Expansion (ASTM D-1883)

MC = Moisture Content (ASTM D-2216)

DD = Density (ASTM D-2937)

Gradation (Particle Size Analysis) (ASTM D-422)

Consolidation (ASTM D-2435)

Direct Shear (ASTM D-3080)

ROCK DESCRIPTION SYSTEM

A. DEGREE OF WEATHERING

The following terms describe the chemical weathering of a rock:

Fresh: No visible sign of decomposition or discoloration. Rings under hammer impact.

Slightly Weathered: Slight discoloration inwards from open fractures, otherwise similar to Fresh

Moderately Weathered: Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken hand or scraped by knife. Texture preserved.

Highly Weathered: Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric preserved.

Completely Weathered: Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated.

Residual Soil: Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change relative to fresh rock.

B. HARDNESS

The following terms describe the resistance of a rock to indentation or scratching:

Very Soft: Can be peeled with a knife, material crumbles under firm blows with the sharp end of a geologic pick.

Soft: Can just be scraped with a knife, indentations of 2 to 4 mm with firm blows of the pick point.

Medium Hard: Cannot be scraped or peeled with a knife, but can be scratched with knife point. Hand held specimen breaks with firm blows of the pick.

Hard: Difficult to scratch with knife point, cannot break hand held specimen.

Very Hard: Cannot be scratched with pocket knife.

C. ROCK FRACTURE CHARACTERISTICS

The following terms describe general fracture spacing of a rock:

Crushed: Less than 5 microns (mechanical clay) to 15 mm

Intensely Fractured: 15 to 31 mm (contains no clay)

Highly Fractured: 31 to 152 mm

Moderately Fractured: 152 to 305 mm

Occasionally Fractured: 305 to 914 mm

Slightly Fractured: Greater than 914 mm

APPENDICES

- Appendix A. Rock Cores Photos
- Appendix B. Photos of Adjacent Quarry Wall
- Appendix C. Photos of Backstop Berm
- Appendix D. Lab Test Data
- Appendix E. Shear Wave Velocity Test Report
- Appendix F. Declaration of Soil Bearing Capacity

APPENDIX A
PHOTOS OF CORES

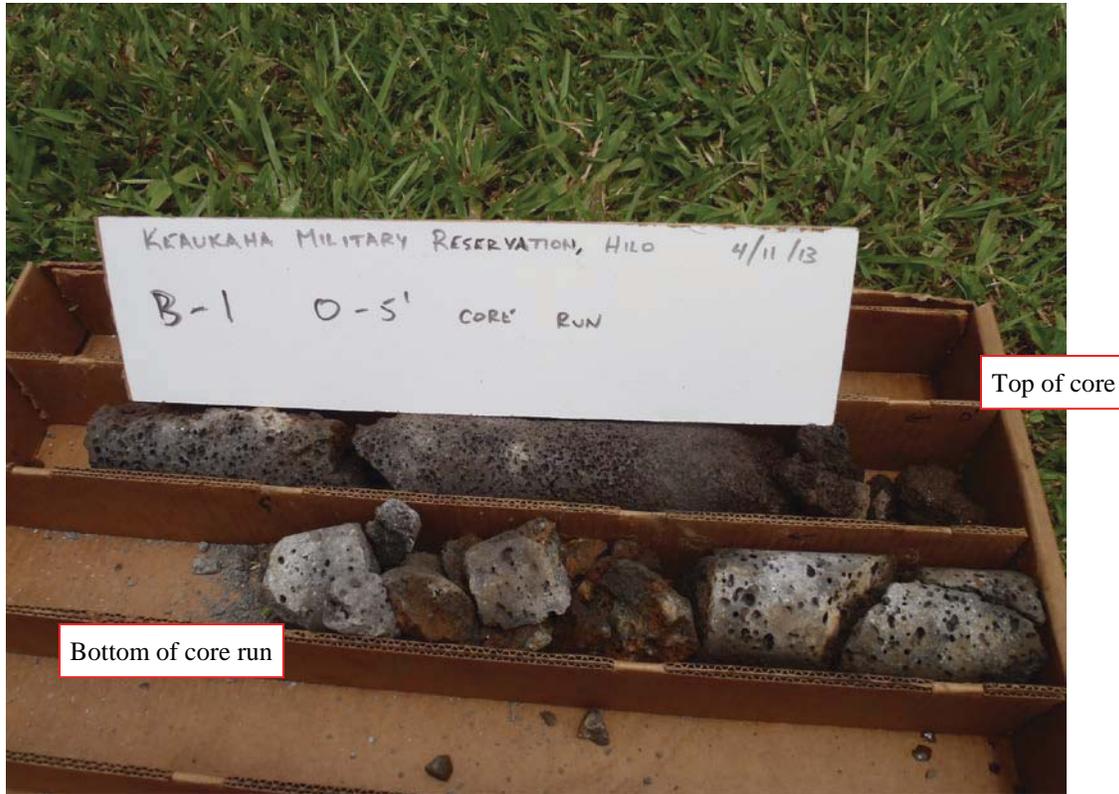


Photo 1. B-1, core run from 0-5 ft.



Photo 2. B-1, core run from 5-10 ft.



Photo 3. B-1, core 0-10 ft.



Photo 4. B-2, core run from 0-5 ft.



Photo 5. B-2, core run from 5-10 ft.



Photo 6. B-2, core 0-10 ft.



Photo 7. B-3, core run from 0-5 ft.

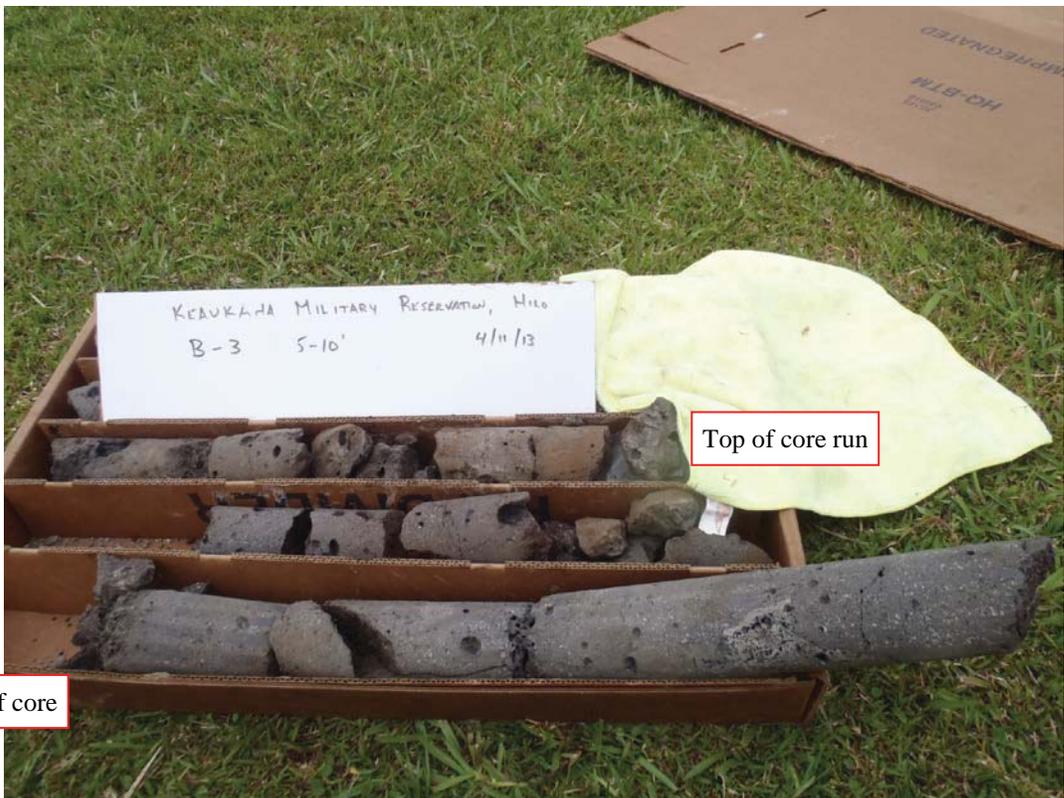


Photo 8. B-3, core run from 5-10 ft.



Photo 9. B-3, core 0-10 ft.

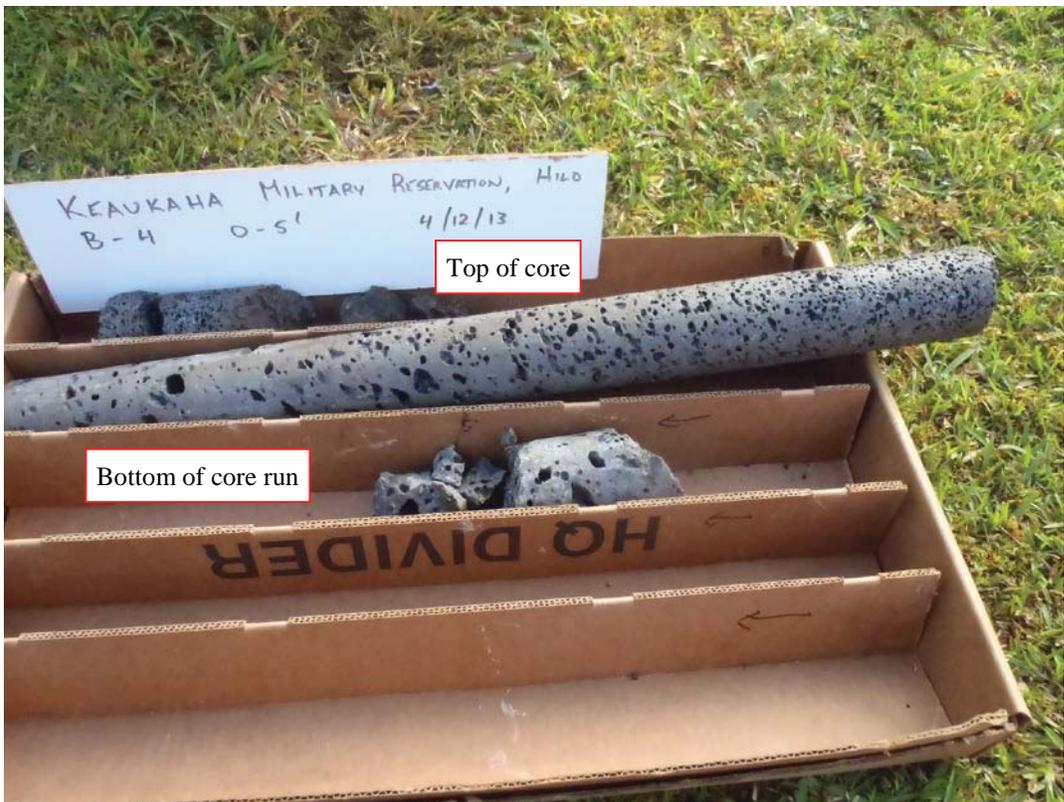


Photo 10. B-4, core run from 0-5 ft.



Photo 11. B-4, core run from 5-10 ft.



Photo 12. B-4, core 0-10 ft.



Photo 13. B-5, core run from 0-5 ft.



Photo 14. B-5, core run from 5-10 ft.



Photo 15. B-5, core 0-10 ft.



Photo 16. B-6, core run from 0-5 ft.



Photo 17. B-6, core run from 5-10 ft.



Photo 18. B-6, core 0-10 ft.

APPENDIX B

PHOTOS OF ADJACENT QUARRY WALL



Photo 19. Quarry wall closest to project site (south side of quarry).



Photo 20. Southeast quarry wall in southern portion of quarry.



Photo 21. East quarry wall in southern portion of quarry.

APPENDIX C

PHOTOS OF BACKSTOP BERM



Photo 22. Berm south of existing baffles.



Photo 23. Berm at southern end of existing baffles. Yellow flag marks boring B-1.



Photo 24. Berm from southern end of existing baffles.



Photo 25. Berm at southern end of proposed new baffle site. B-3 in foreground; B-2 near berm.

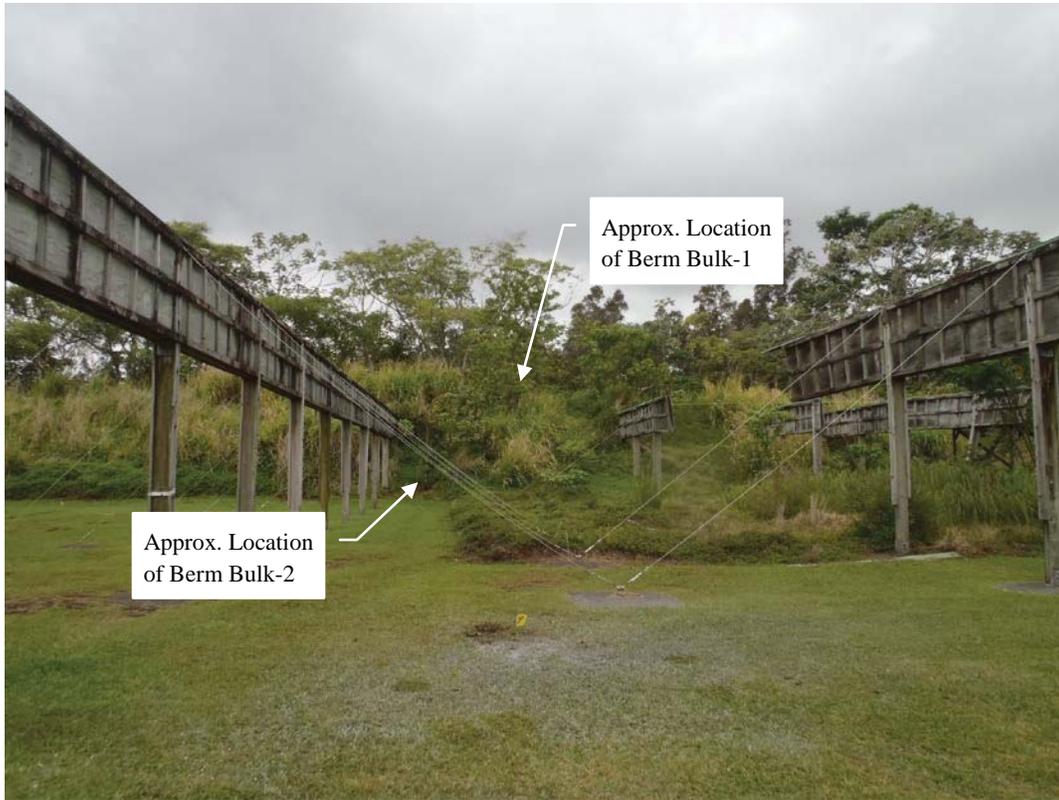


Photo 26. Berm in middle of proposed new baffle site. Yellow flag in foreground marks boring B-4.



Photo 27. Berm Bulk-2.



Photo 28. Looking down from top of berm, just north of Berm Bulk-1.



Photo 29. Existing berm. Row is between borings B-4 and B-5.



Photo 30. Existing berm at north end of proposed new baffle site. Yellow flag marks boring B-5.

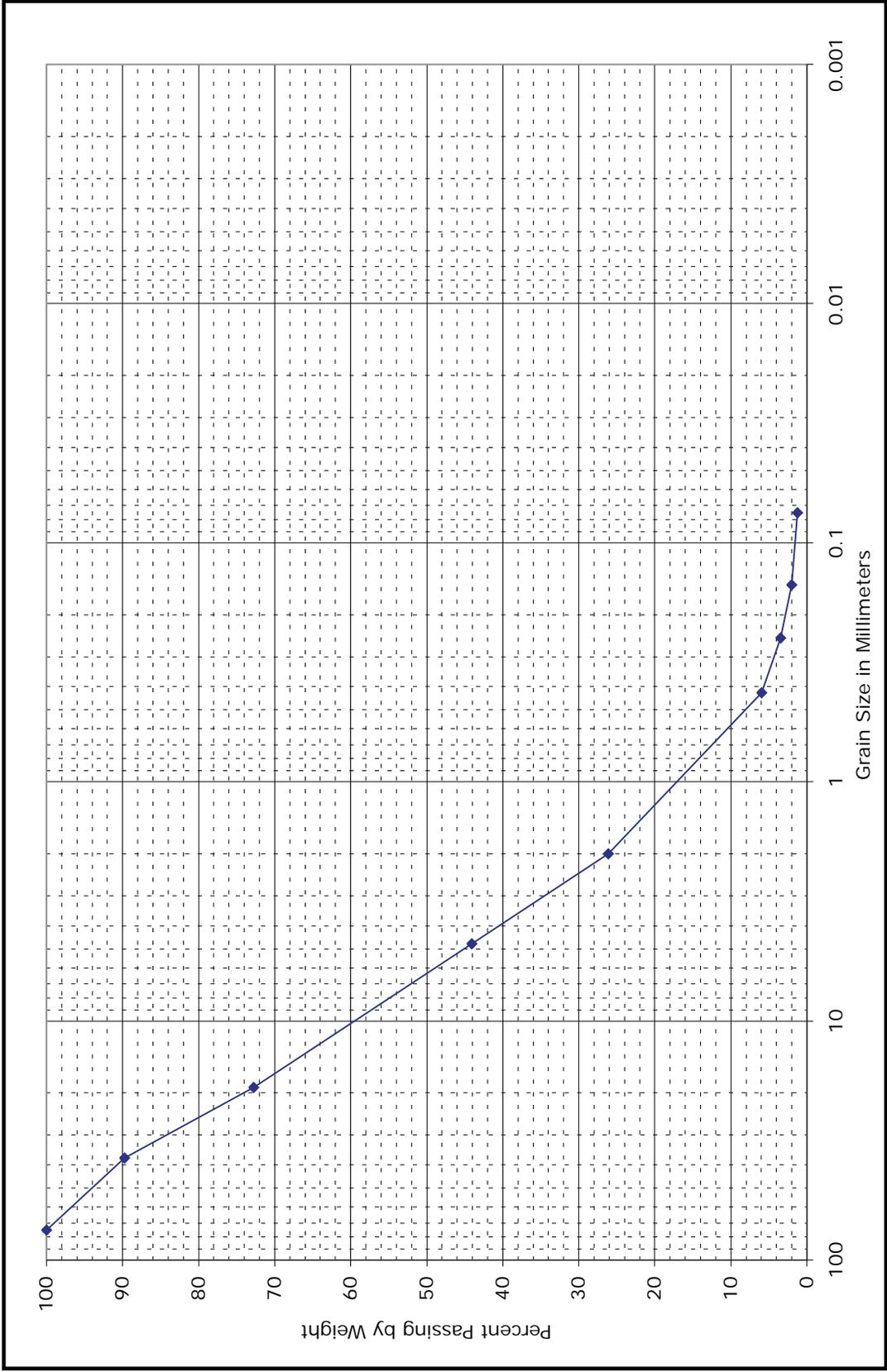


Photo 31. North end of berm. Yellow flag marks boring B-6.

APPENDIX D
LAB TEST DATA

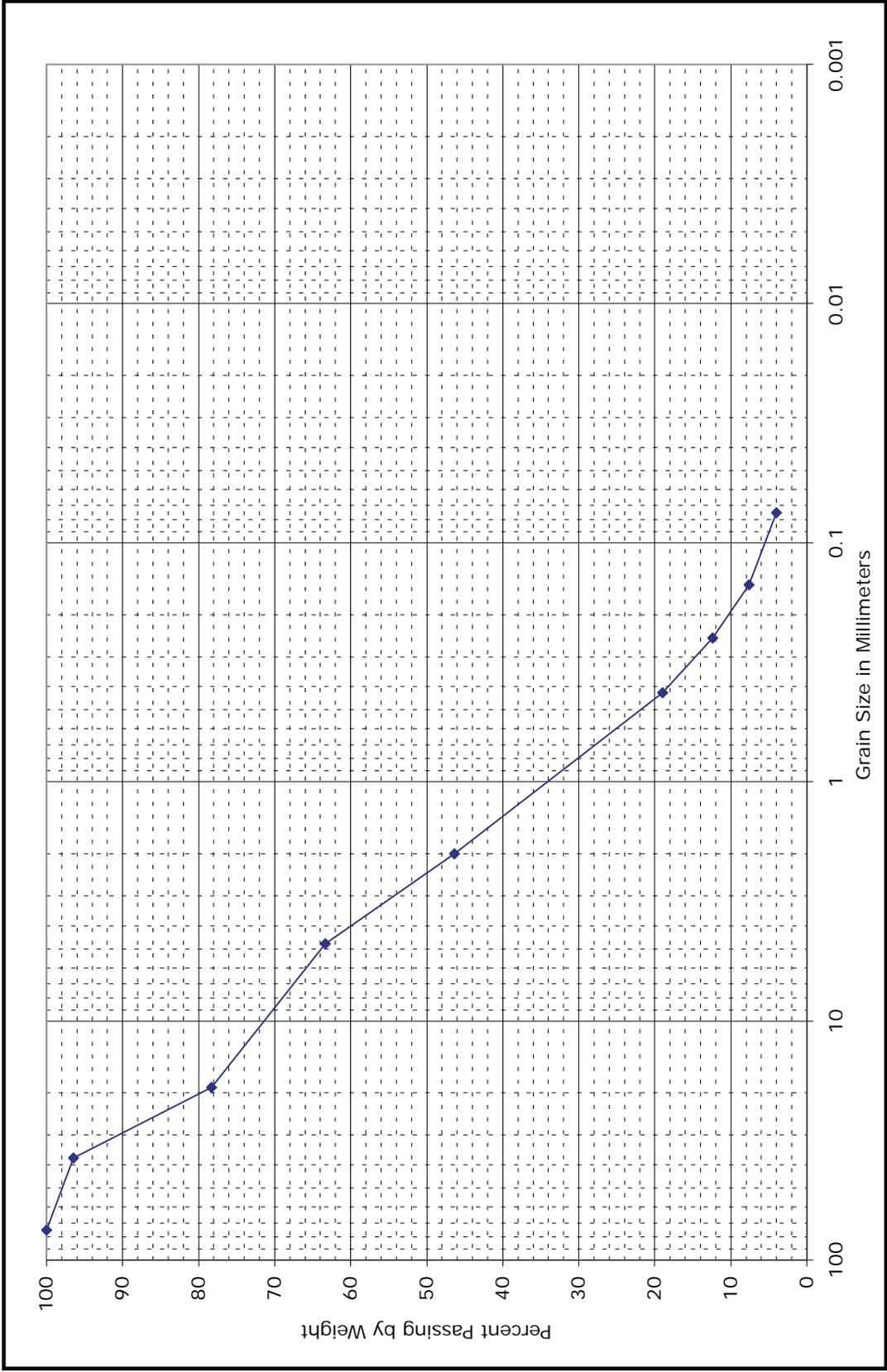
Grain Size Analysis

Project: HIARNG BAFFLED RANGE Date Received: 4/19/13 Figure: D-1.1
Sample: B4-Bulk Date Performed: 4/22/13 MFA Job No.: 12555-002
Depth: 1 "-6" Date Reported: 4/25/13 Soil Classification Well graded gravel w/ sand
Location: Keaukaha Military Reservati Client: SAIC UCSC: GW ASTM D136



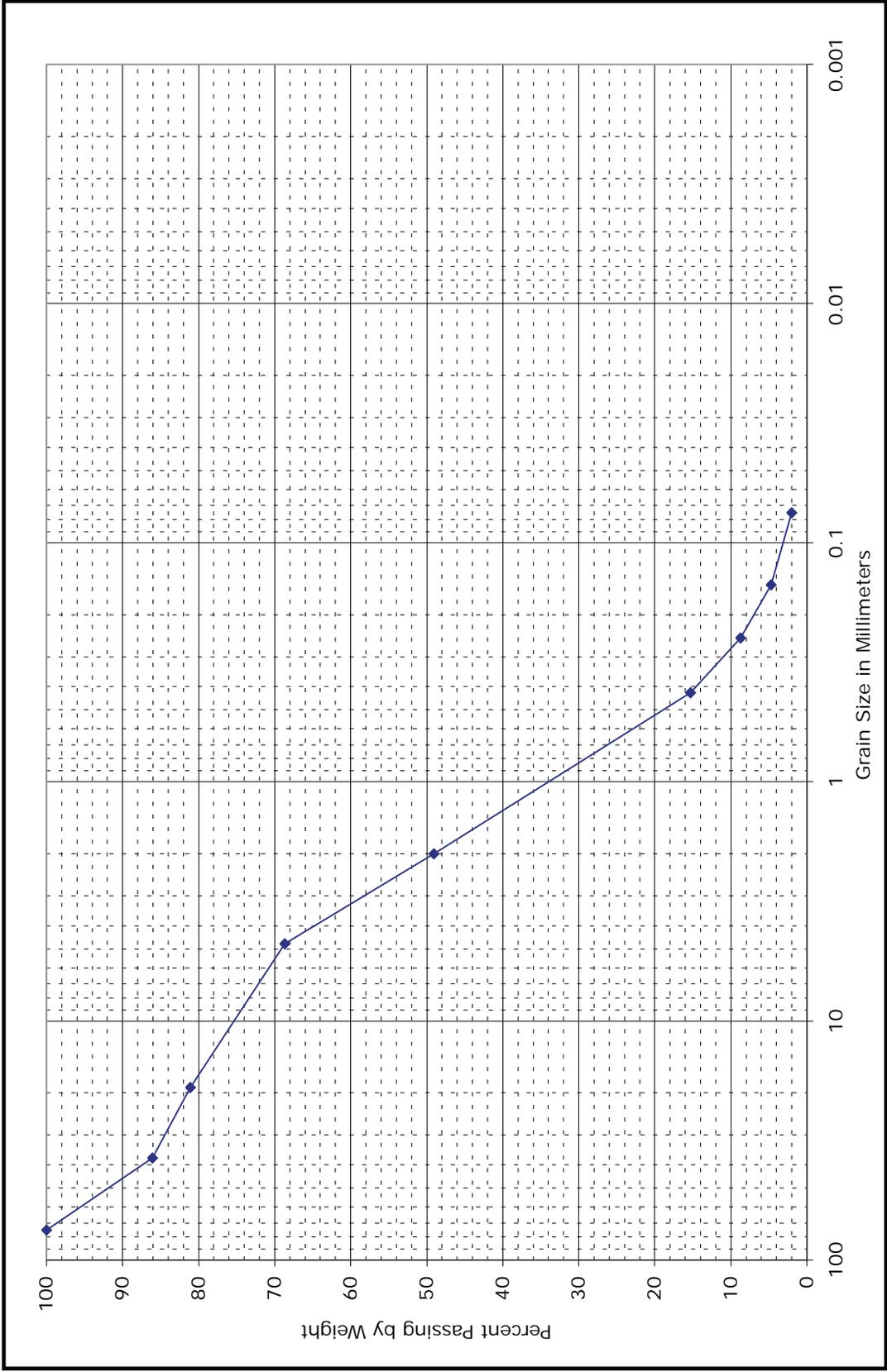
Grain Size Analysis

Project: HIARNG BAFFLED RANGE Date Received: 4/19/13 Figure: D-1.2
Sample: Berm- Bulk 1 Date Performed: 4/22/13 MFA Job No.: 12555-002
Depth: 0-1' Date Reported: 4/25/13 Soil Classification Poorly graded sand w/ gravel
Location: Keaukaha Military Reservati Client: SAIC UCSC: SP ASTM D136



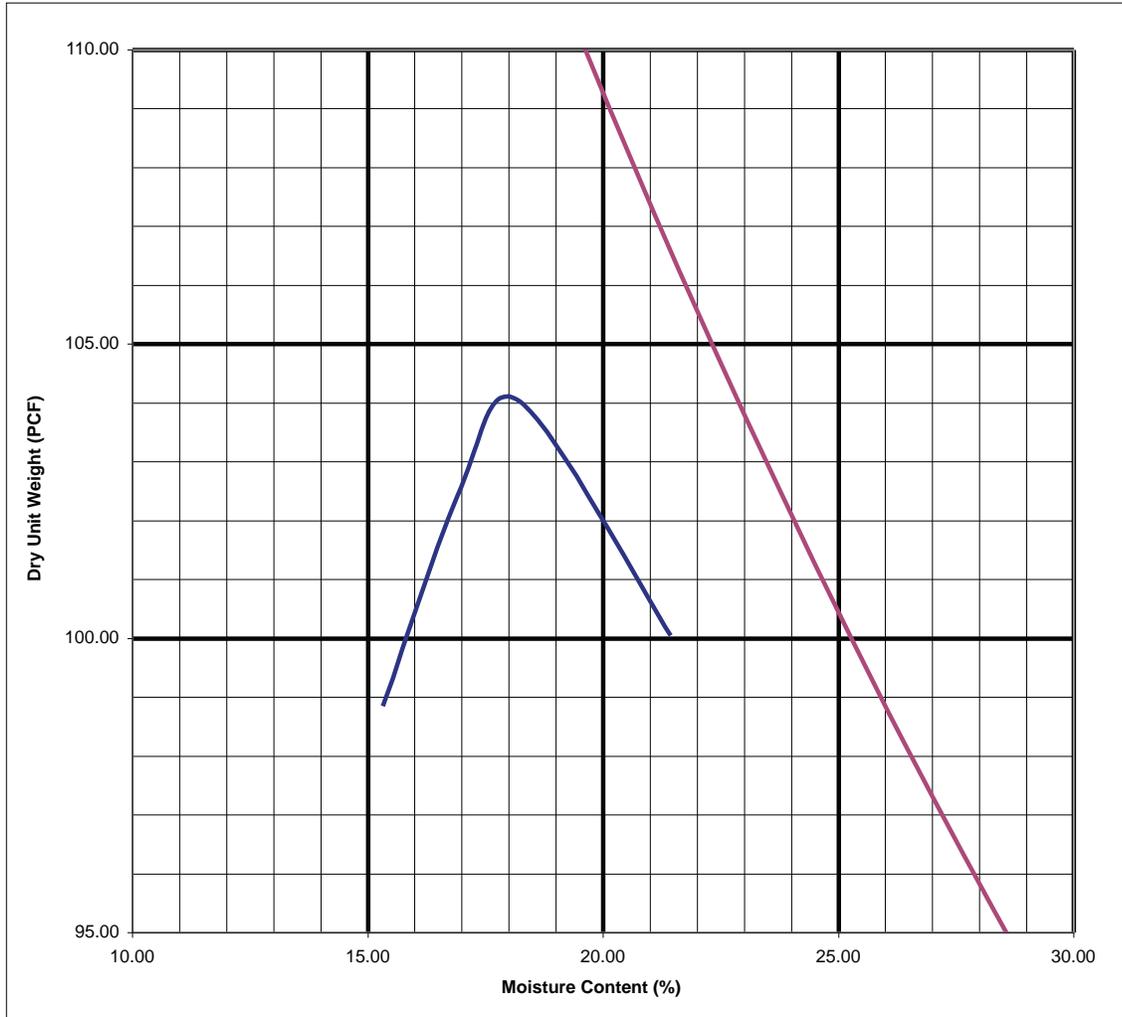
Grain Size Analysis

Project: HIARNG BAFFLED RANGE Date Received: 4/19/13 Figure: D-1.3
Sample: Berm- Bulk 2 Date Performed: 4/22/13 MFA Job No.: 12555-002
Depth: 0-1' Date Reported: 4/25/13 Soil Classification Poorly graded sand w/ gravel
Location: Keaukaha Military Reservati Client: SAIC UCSC: SP ASTM D136



Project: HIARNG BAFFLED RANGE
 Location: Keaukaha Military Reservation
 Soil: Brn sand w/ gravel
 Sample: Berm-Bulk 1
 Depth: 0-1'
 Job No.: 12555-002
 Client: SAIC

Figure: D-2.1
 Method Used: C
 Preparation Method: Dry
 Rammer: Mechanical
 Date Received: 4/19/13
 Date Tested: 4/23/13
 Date Reported: 4/25/13



Specific Gravity:

Method of Compaction: Modified (ASTM D1557)

Test Results:

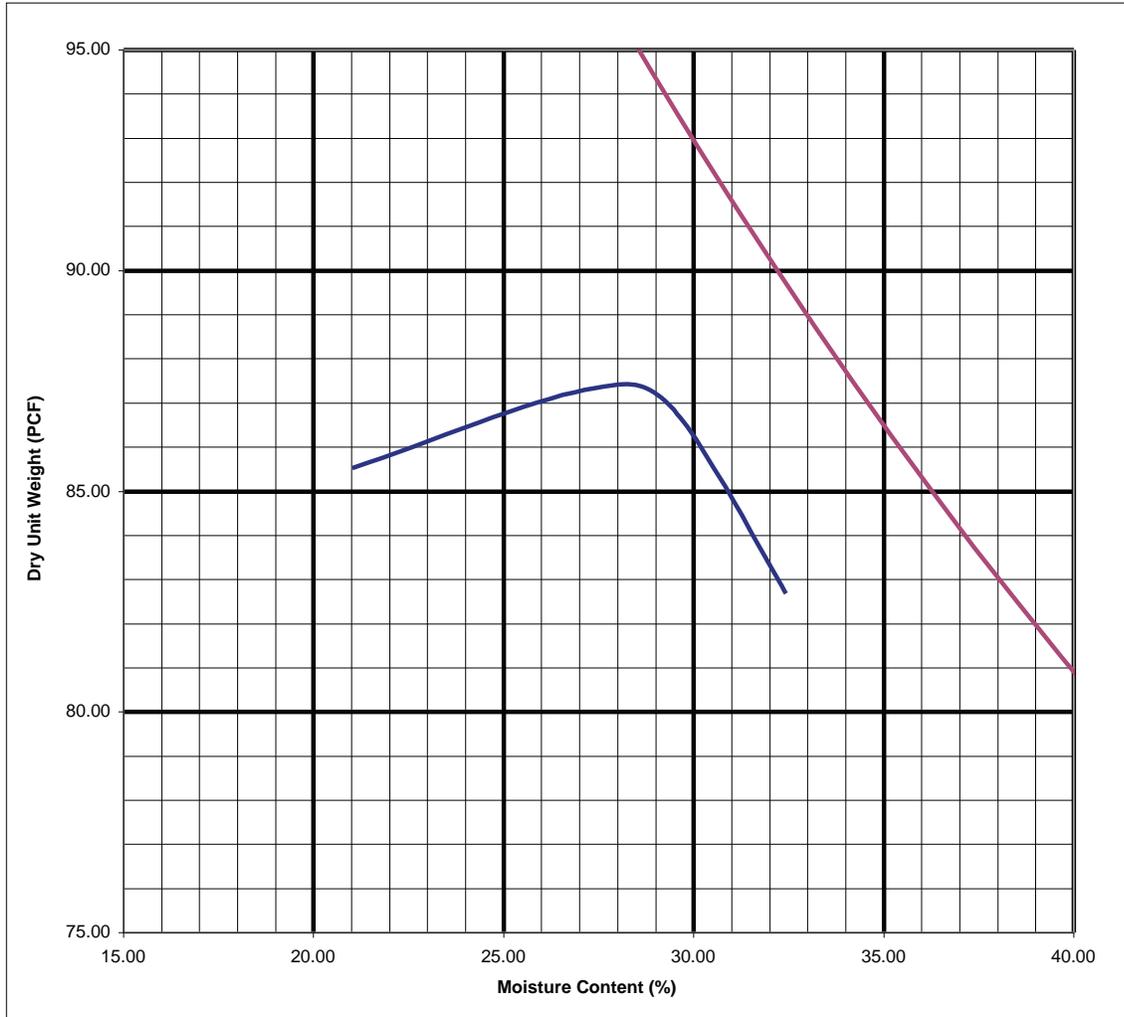
Optimum Moisture Content = 18.0 %
 Maximum Dry Density = 104.0 PCF
 Corrected Maximum Dry Density = PCF
 Corrected Opt Moisture Content = %
 Initial Moisture Content = 18.7 %

Total wt.	34.6
retained 3/4	18.6%
retained 3/8	7.7%
retained #4	6.9%
passing #4	66.8%

Masa Fujioka & Associates
 98-021 Kamehameha Hwy. #337
 Aiea, HI 96701

Project: HIARNG BAFFLED RANGE
 Location: Keaukaha Military Reservation
 Soil: Brn sand w/ gravel
 Sample: Berm-Bulk 2
 Depth: 0-1'
 Job No.: 12555-002
 Client: SAIC

Figure: D-2.2
 Method Used: C
 Preparation Method: Dry
 Rammer: Mechanical
 Date Received: 4/19/13
 Date Tested: 4/23/13
 Date Reported: 4/25/13



Specific Gravity:

Method of Compaction: Modified (ASTM D1557)

Test Results:

Optimum Moisture Content = 27.0 %
 Maximum Dry Density = 87.5 PCF
 Corrected Maximum Dry Density = PCF
 Corrected Opt Moisture Content = %
 Initial Moisture Content = 40.2 %

Total wt.	29.85
retained 3/4	11.2%
retained 3/8	3.4%
retained #4	8.4%
passing #4	77.1%

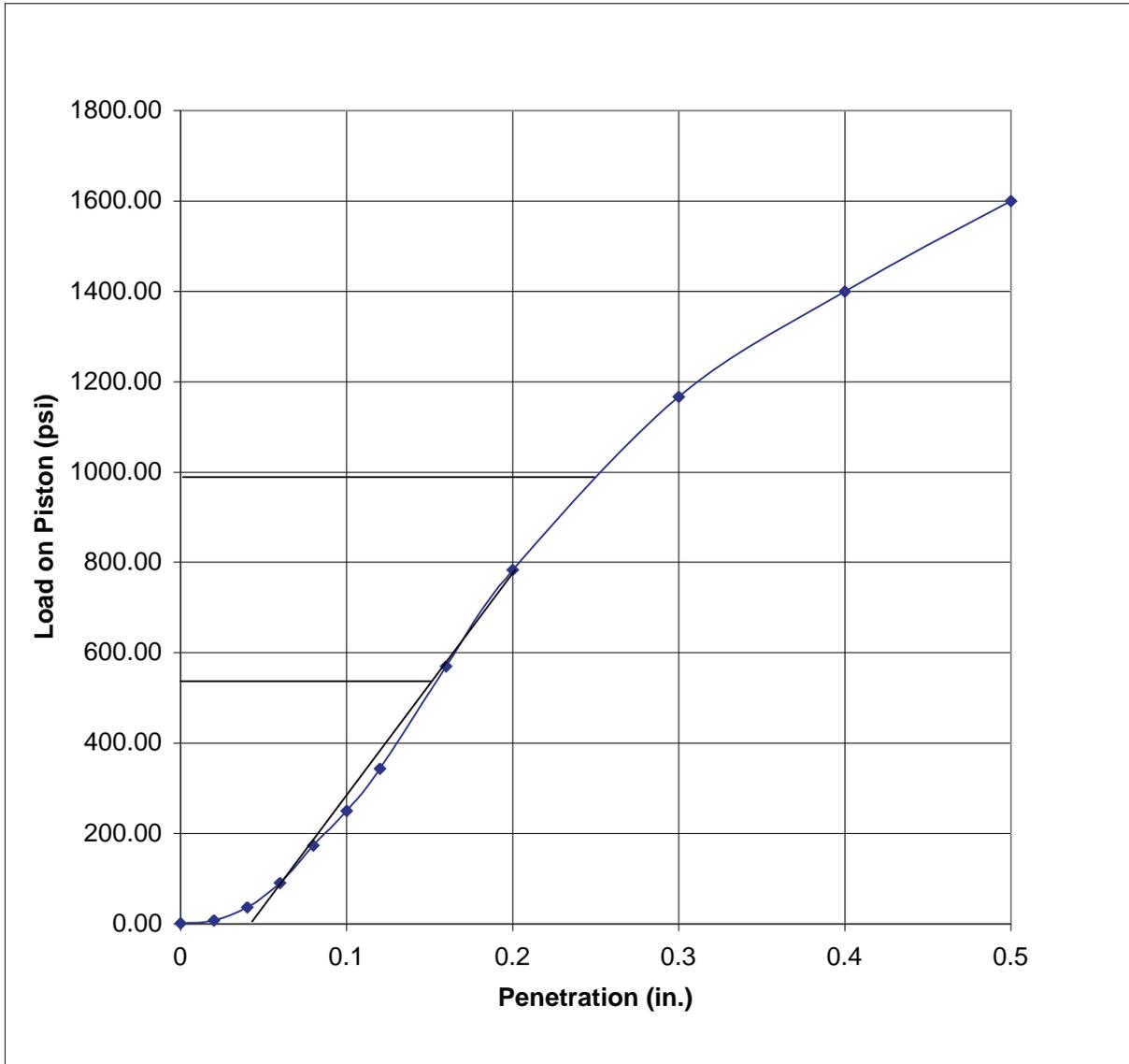
Masa Fujioka & Associates

98-021 Kamehameha Hwy. #337
 Aiea, HI 96701

Project: HIARNG BAFFLED RANGE
 Job No.: 12555-002
 Location: Keaukaha Military Reservation
 Soil: Brn sand w/ gravel
 Sample: Berm- Bulk 1 Depth: 0-1'

Method: ASTM 1557
 Surcharge: 12.5 lbs
 Condition of Sample: Soaked
 Client: SAIC

Figure: D-3.1



CBR at 0.1 = 54 %

at 0.2 = 66 %

LINEAR EXPANSION: 0.31 %

Dry Unit wt. before soaking: 102.1 PCF

Dry Unit wt. after soaking: 94.5 PCF

H2O before soaking: 18.2 %

H2O after soaking: 33.3 %

H2O top 1": 29.3 %

CBR 1883 Test Result

Date Received: 4/19/13

Date Tested: 4/23/13

Date Reported: 4/29/13

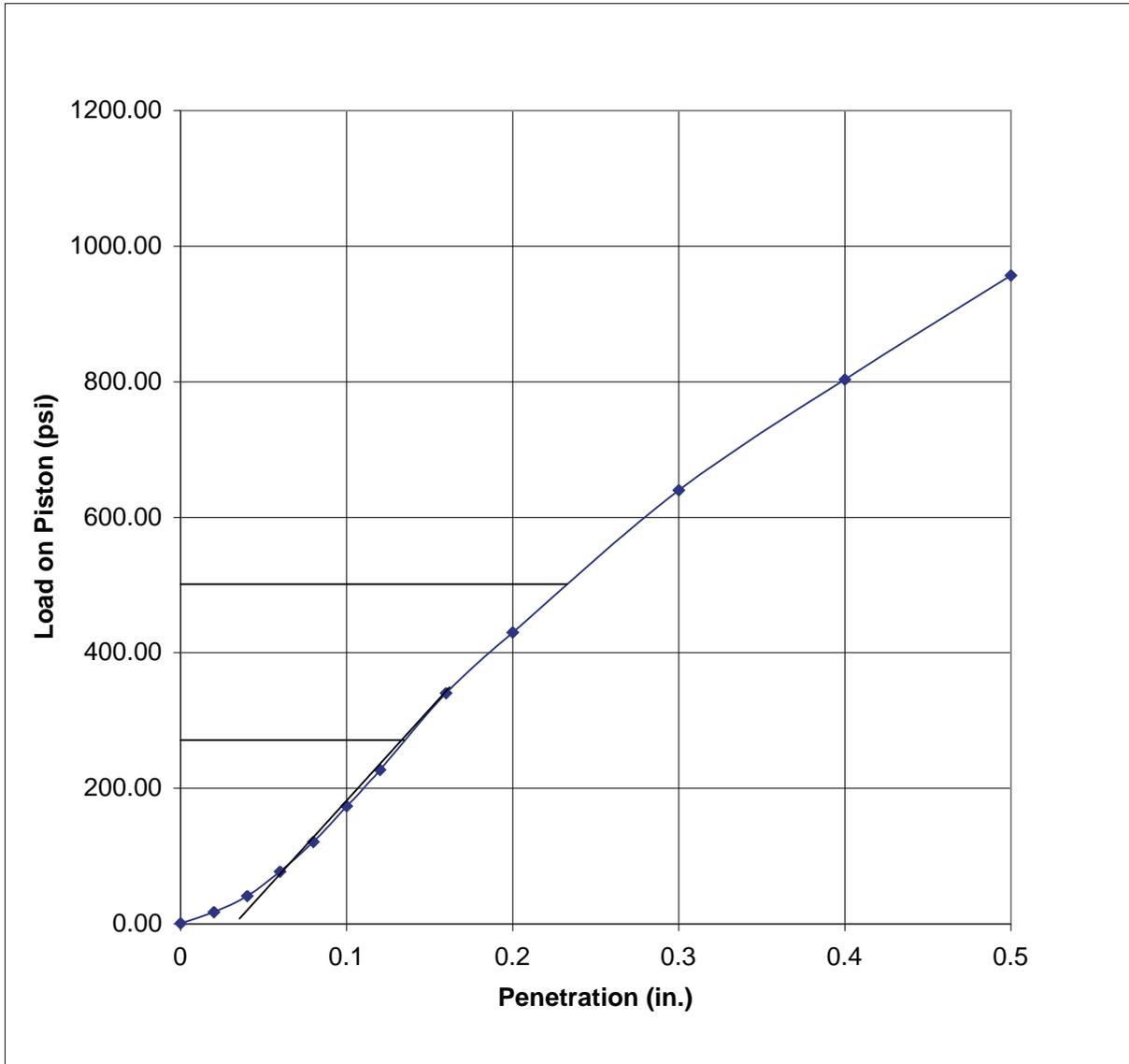
MASA FUJIOKA & ASSOCIATES

98-021 Kamehameha Hwy. #337

Aiea, HI 96701

Project: HIARNG BAFFLED RANGE
 Job No.: 12555-002
 Location: Keaukaha Military Reservation
 Soil: Brn sand w/ gravel
 Sample: Berm- Bulk 2 Depth: 0-1'

Method: ASTM 1557
 Surcharge: 12.5 lbs
 Condition of Sample: Soaked
 Client: SAIC Energy
 Figure: D-3.2



CBR at 0.1 = 38 %
 at 0.2 = 33 %
 LINEAR EXPANSION: 0.99 %
 Dry Unit wt. before soaking: 85.1 PCF
 Dry Unit wt. after soaking: 81.4 PCF
 H2O before soaking: 26.9 %
 H2O after soaking: 37.6 %
 H2O top 1": 39.2 %

CBR 1883 Test Result
 Date Received: 4/19/13
 Date Tested: 4/23/13
 Date Reported: 4/29/13

MASA FUJIOKA & ASSOCIATES

98-021 Kamehameha Hwy. #337

Aiea, HI 96701

APPENDIX E

SHEAR WAVE VELOCITY TEST REPORT



AECOM 303 228 3000 tel
717 17th St., Suite 2600 303 228 3001 fax
Denver, CO 80202
www.aecom.com

January 29, 2013

Masa Fujioka
Managing Partner, Masa Fujioka and Associates
98-021 Kamehameha Highway, Suite 337
Aiea, HI 96701

**Report of Shear Wave Velocity Testing and Seismic Site Classification
HIARNG Baffled Range
Keaukaha Military Reservation, Hilo, Hawaii
AECOM Project Number 60284525**

Dear Mr. Fujioka,

As authorized, AECOM Technical Services, Incorporated (AECOM) has conducted shear wave velocity testing to evaluate the Seismic Site Class for the HIARNG Baffled Range Facility within the Keaukaha Military Reservation near Hilo, Hawaii. This report presents a brief summary of our understanding of the project, a discussion of our testing program and our evaluation of the results.

PROJECT INFORMATION

The site of the project is located a short distance to the south of the Hilo Airport as shown on Figure 1. The site currently consists of an open, grassed parcel of land occupied by a rifle shooting range. A series of earthen berms are present along the length of the range running perpendicular to the line of fire. We understand that this parcel is to be redeveloped by the Army National Guard into an updated rifle range.

Observations made in the field at the time of the testing program revealed frequent outcroppings of basaltic bedrock within the confines of the site. A thin cover of soil was generally observed to be present in other areas, except where earthen berms resulted in greater thicknesses of soil. Rock quarries were observed to the north and northwest of the project site.

TESTING PROCEDURE

For the purposes of evaluating the shear wave velocity profile within the project site, AECOM conducted two Refraction Microtremor (ReMi) surveys. For this project, each of the ReMi lines included a series of 24 geophones inserted into surface materials on a 10 foot horizontal spacing. The lines were located as portrayed on Figure 2, attached.

Background vibrations were measured and employed in a wavefield transformation data processing technique to allow for the interpretation of the shear wave velocity profile. Each seismic line was evaluated to assess the shear wave within segments of each array. These were subsequently integrated to develop a 2-dimensional profile along the extent of the two lines to characterize shear wave velocity and profile trends. The resulting profile, presented on Figure 3 indicates variations in shear wave velocities along and below the ground surface along the length of the array by means of various colors. For reference, blue shades are indicative of firm soils and weak rock. Green, yellow and red shades are indicative of more intact bedrock.

The average profiles developed for Lines 1 and 2 are attached on Figures 4 and 5. The average shear wave velocity to a depth of 100 feet determined from these tests ranged from 1246 to 1338 feet/second. These values are consistent with the characteristics of Seismic Site Class C as defined by the International Building Code.

The IBC probabilistic ground motion values for latitude 19.698° and longitude -155.029° obtained from the USGS geohazards web page are as follows:

Period (seconds)	2% Probability of Event in 50 years (%g)	Site Coefficient F_a	Site Coefficient F_v
0.2 (S_s)	1.50	1.0	
1.0 (S_1)	0.06		1.3

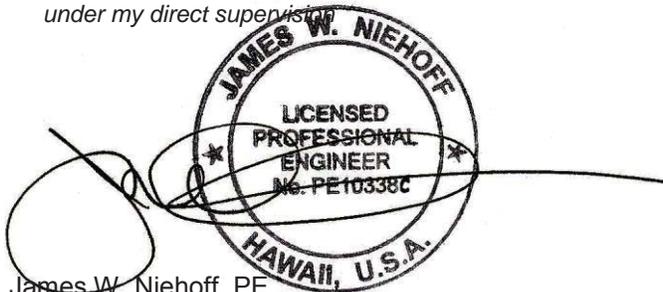
The Site Coefficients, F_a and F_v presented in the above table were interpolated from IBC Tables 1615.1.2(1) and 1615.1.2(2) as a function of the site classification and mapped spectral response acceleration at the short (S_s) and 1 second (S_1) periods.

We have appreciated the opportunity to serve as your geotechnical consultant for this project. If you should have any questions, please contact the undersigned at (303) 704-8390.

Sincerely,

AECOM Technical Services, Inc.

This report was prepared by me or under my direct supervision



James W. Niehoff, PE
Principal Geotechnical Engineer

Mariel Quevedo
Geotechnical Consultant

North
↑



Project Site



Site Location

HIARNG Baffled Range
Keaukaha Military Reservation, Hilo, Hawaii

Figure 1

Project Number 60284525



Figure 2

Project Number 60284525

Test Locations

HIARNG Baffled Range
Keaukaha Military Reservation, Hilo, Hawaii



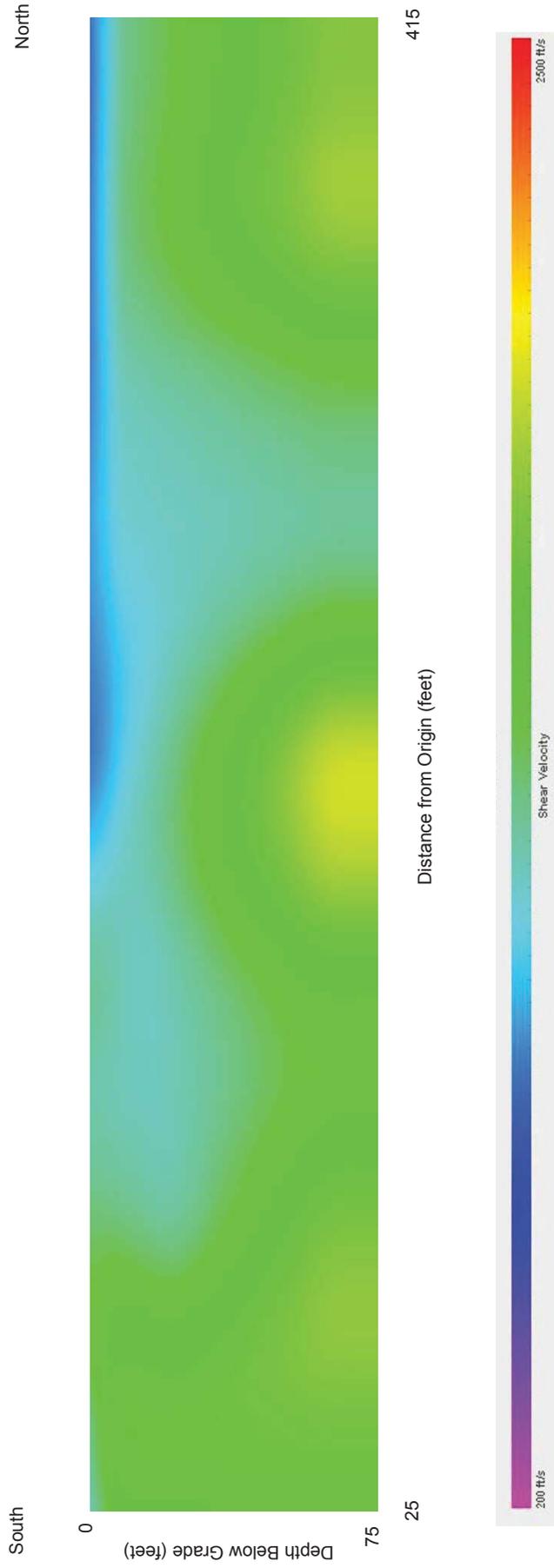


Figure 3

ReMi Profile – Combined Lines 1 and 2
 HIARNG Baffled Range
 Keaukaha Military Reservation, Hilo, Hawaii



Project Number 60284525

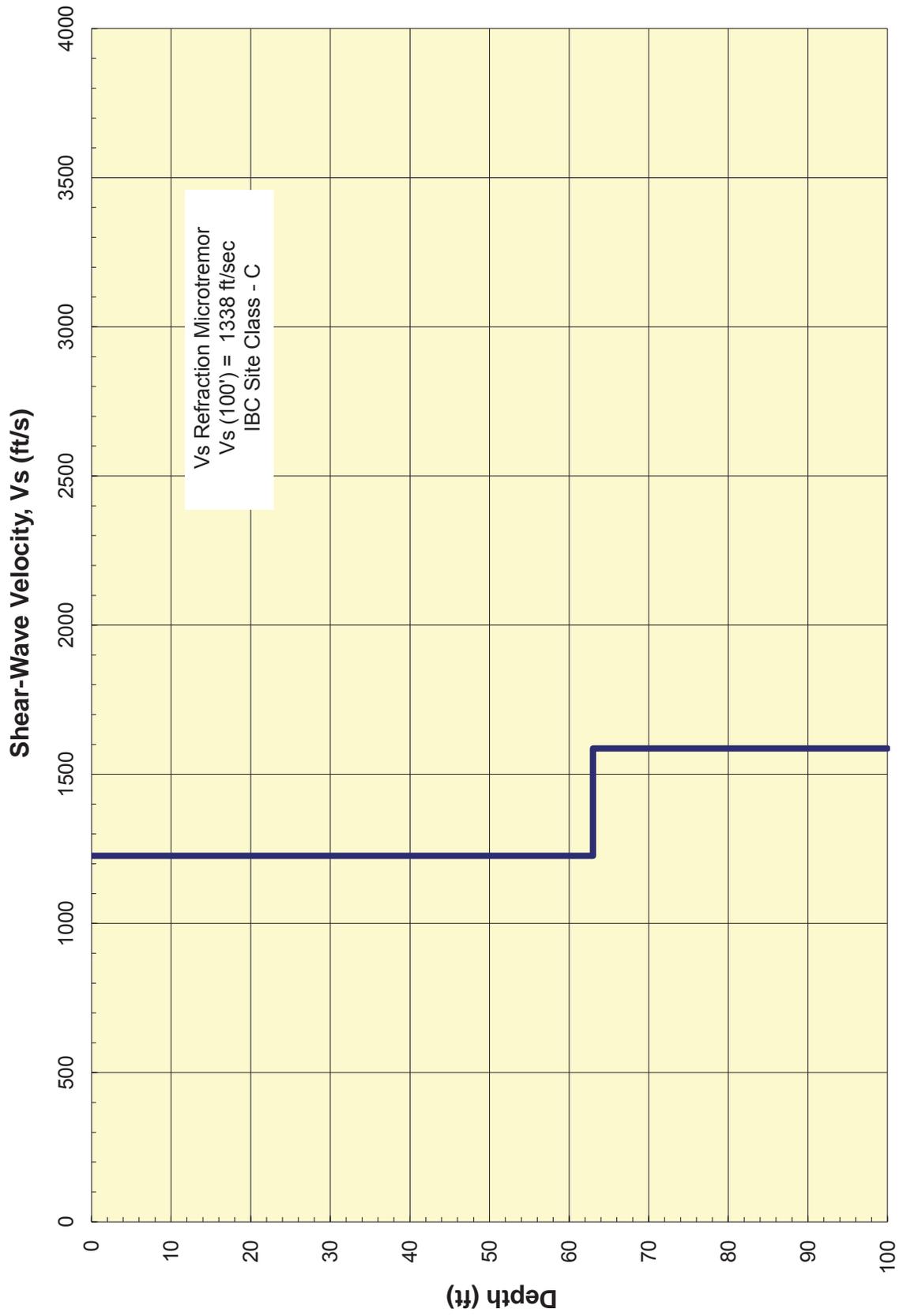


Figure 4

Average ReMi Profile - Line 1
 HIARNG Baffled Range
 Keaukaha Military Reservation, Hilo, Hawaii

Project Number 60284525



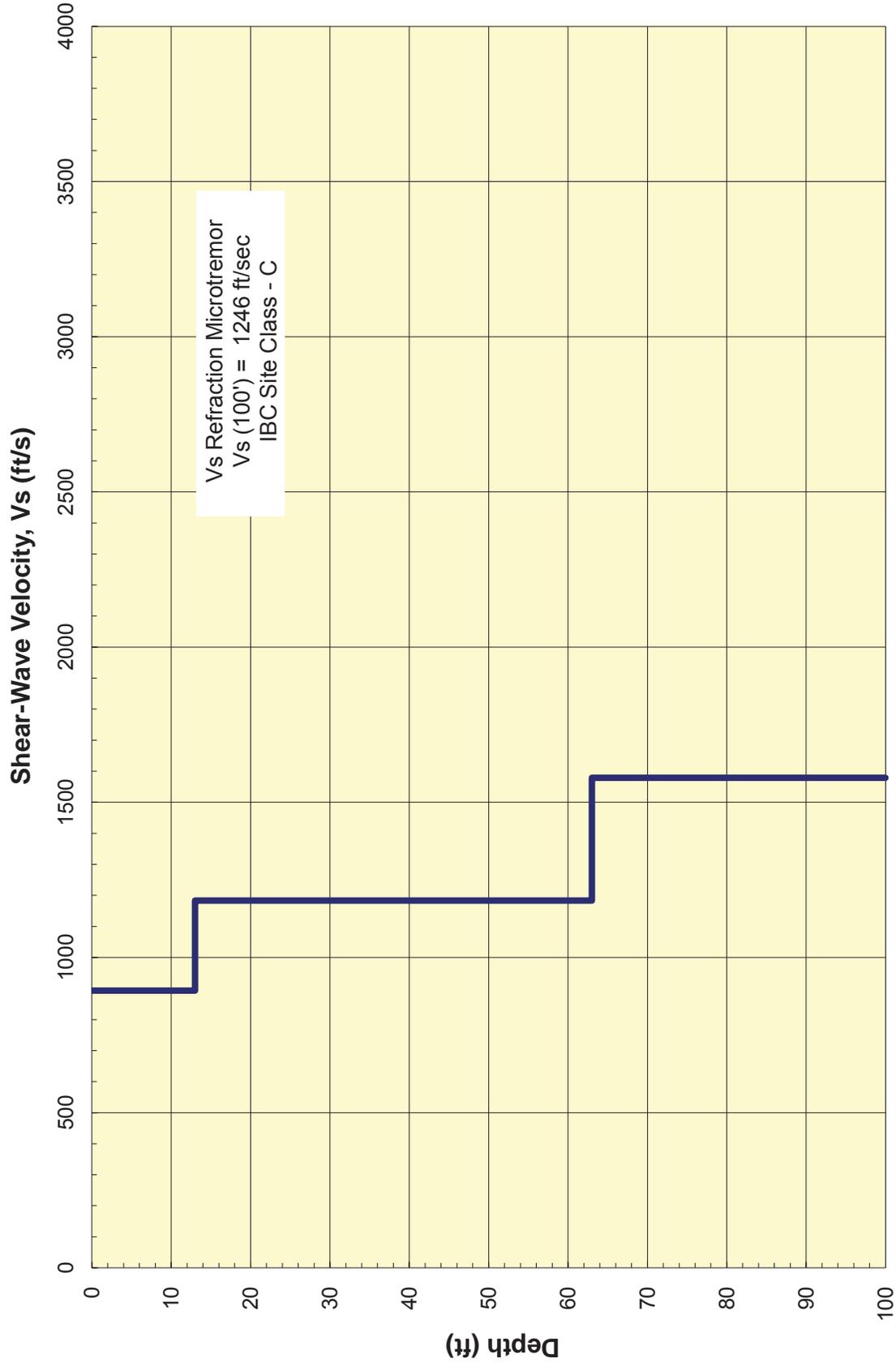


Figure 5

Project Number 60284525

Average ReMi Profile - Line 2
 HIARNG Baffled Range
 Keaukaha Military Reservation, Hilo, Hawaii



APPENDIX F

DECLARATION OF SOIL BEARING CAPACITY

DECLARATION
OF
SOIL BEARING CAPACITY

State: Hawai'i

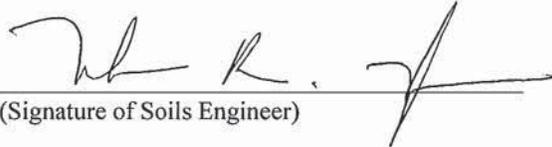
Date: May 7, 2013

Site Location: Hilo, Island of Hawai'i

Address: Keaukaha Military Reservation

Project: Proposed HIARNG Baffled Range

On the basis of our surface and subsurface investigation, and on generally accepted practices and procedures of the geotechnical engineering profession, I hereby declare to the best of my professional opinion, that the existing soil conditions at the site for this project are of a nature and classification which determine that the undisturbed soils at elevation ~65 ft MSL feet (elevation of the bottom of the proposed footing) when considered in conjunction with the supporting capability of the underlying soils strata, are rated at an allowable design bearing capacity of not less than 2500 pounds per square foot for a spread footing type of building foundation.



(Signature of Soils Engineer)

Masanobu R. Fujioka

(Soils Engineer Name)

Managing Partner

(Title)

Masa Fujioka & Associates

(Firm Name)